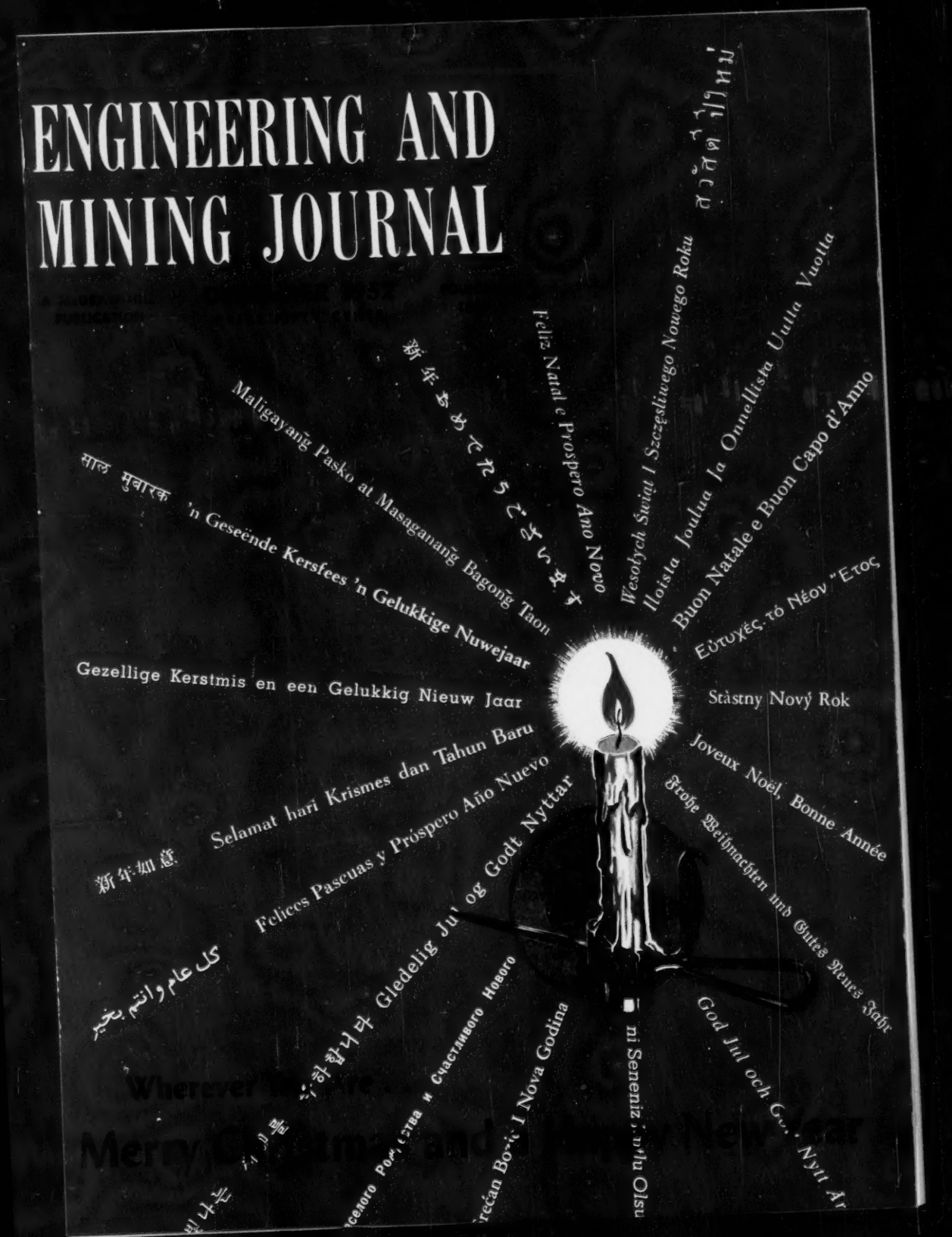
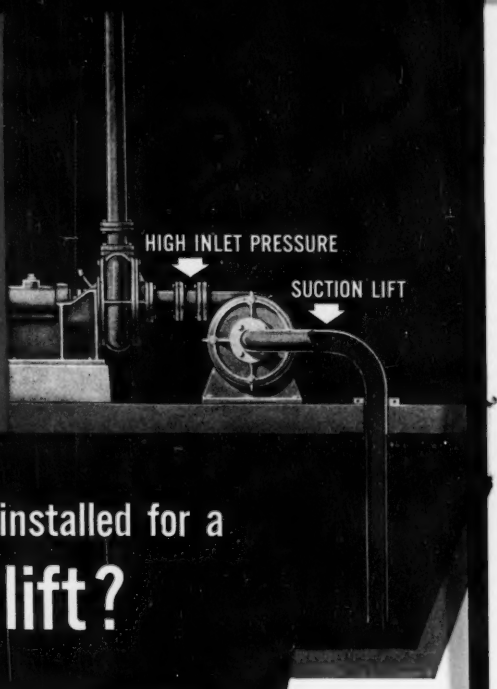
ENGINEERING AND MINING JOURNAL


Feliz Natal e Prospero Ano Novo
新年おめでとうございます
Maligayang Pasko at Masaganang Bagong Taon
मालद मुबारक 'n Geseënde Kersfees 'n Gelukkige Nuwejaar
Gezellige Kerstmis en een Gelukkig Nieuw Jaar
新年如意 Selamat hari Krismes dan Tahun Baru
Felices Pascuas y Próspero Año Nuevo
Gledelig Ju' og Godt Nyttar
كل عام وانتم بخير
Wesołych Świąt I Szczęśliwego Nowego Roku
สวัสดีปีใหม่
Iloista Joulua Ja Onnellista Uutta Vuotta
Buon Natale e Buon Capo d'Anno
Εὐτυχὲς τὸ Νέον Ἔτος
Stàstny Nový Rok
Joyeux Noël, Bonne Année
Frohe Weihnachten und Gutes Neues Jahr
God Jul och Gott Nytt År
Merry Christmas and Happy New Year

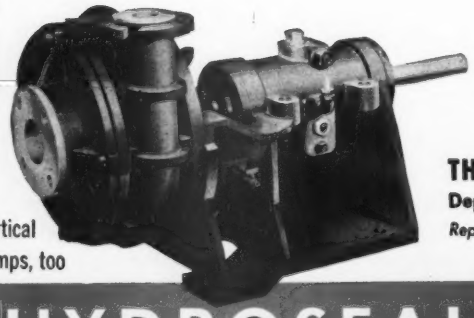
How to get more pump for your money



Here are two good questions to ask when you're in the market for abrasive-handling pumps:

1. Can they be installed for a **suction lift?**
2. Will they operate with extreme **inlet pressures?**

Hydroseals take both of these adverse conditions in stride, and thereby allow more flexible installation. Location is not limited to small inlet heads and other restrictive features of design. Get the facts and you'll get Hydroseals.



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SAND, SLURRY & DREDGE PUMPS
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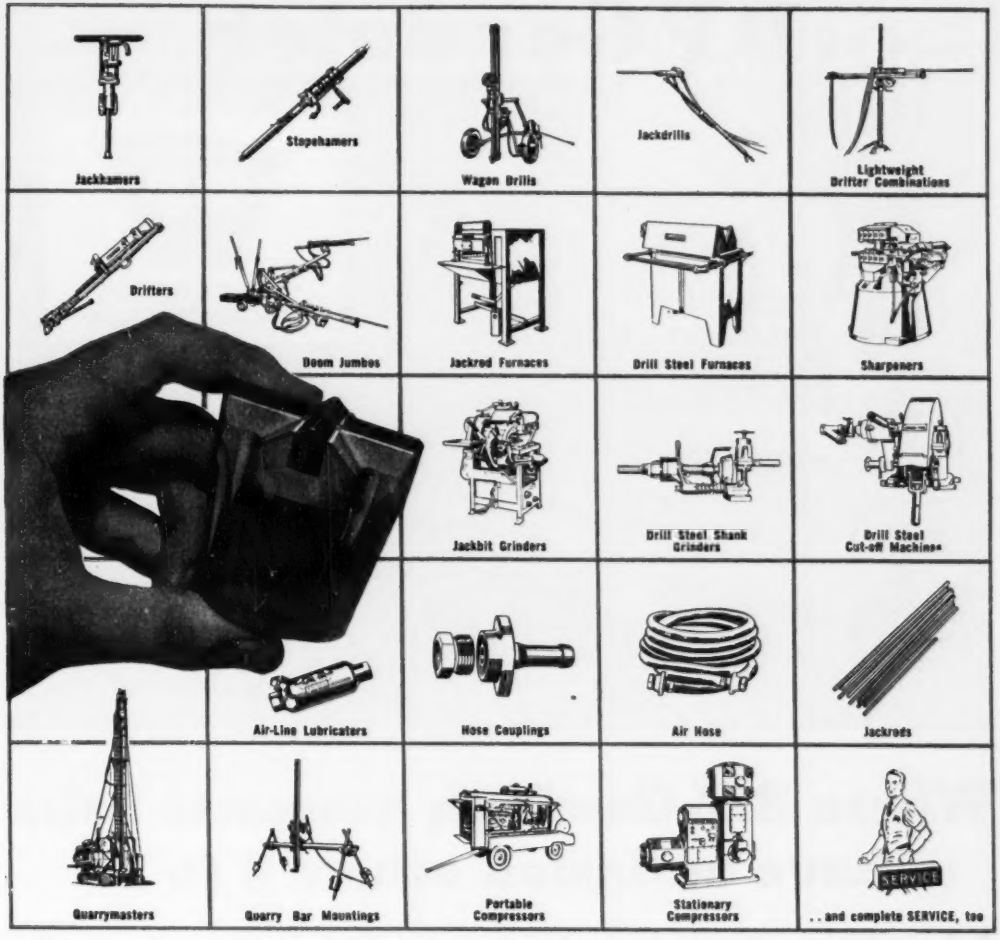

Behind the Carset Jackbit

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RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Where B.F.Goodrich grommet belts have outlasted others 8 to 1

B. F. Goodrich grommet V belts cut costs 20 to 50%

EACH time this machine is started the belts that drive it take a beating. The shock, combined with the heavy pulling load and high speed, caused the first set of V belts used on this drive to fail in only 6 months. Something exceptional was needed, so B. F. Goodrich grommet V belts were installed. That was over 4 years ago, and they're still in use. In fact, the company superintendent says it looks as though this same set of grommet V belts will operate another 10 years. Here's why B. F. Goodrich grommet belts outperform ordinary belts:

No cord ends — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. There are no layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet V belts stretch less — only ⅓ as much, on an average, as ordinary V belts.

Better grip, less slip — Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

They cost no more — Grommet V belts cut costs because they last longer, increase production because machines keep running with fewer interruptions, reduce maintenance costs because they need less attention, yet they cost not one cent more. Available in C, D, and E sections. But remember, only B. F. Goodrich makes the grommet V belt (U. S. Patent No. 2,233,294), so to get all these savings, call in your local BFG distributor the next time you need V belts, or write *The B.F.Goodrich Company, Industrial & General Products Division, Akron, Ohio.* (Available in Canada)

Grommet V-Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

VOLUME 153 — 86th YEAR OF PUBLICATION — NUMBER 12

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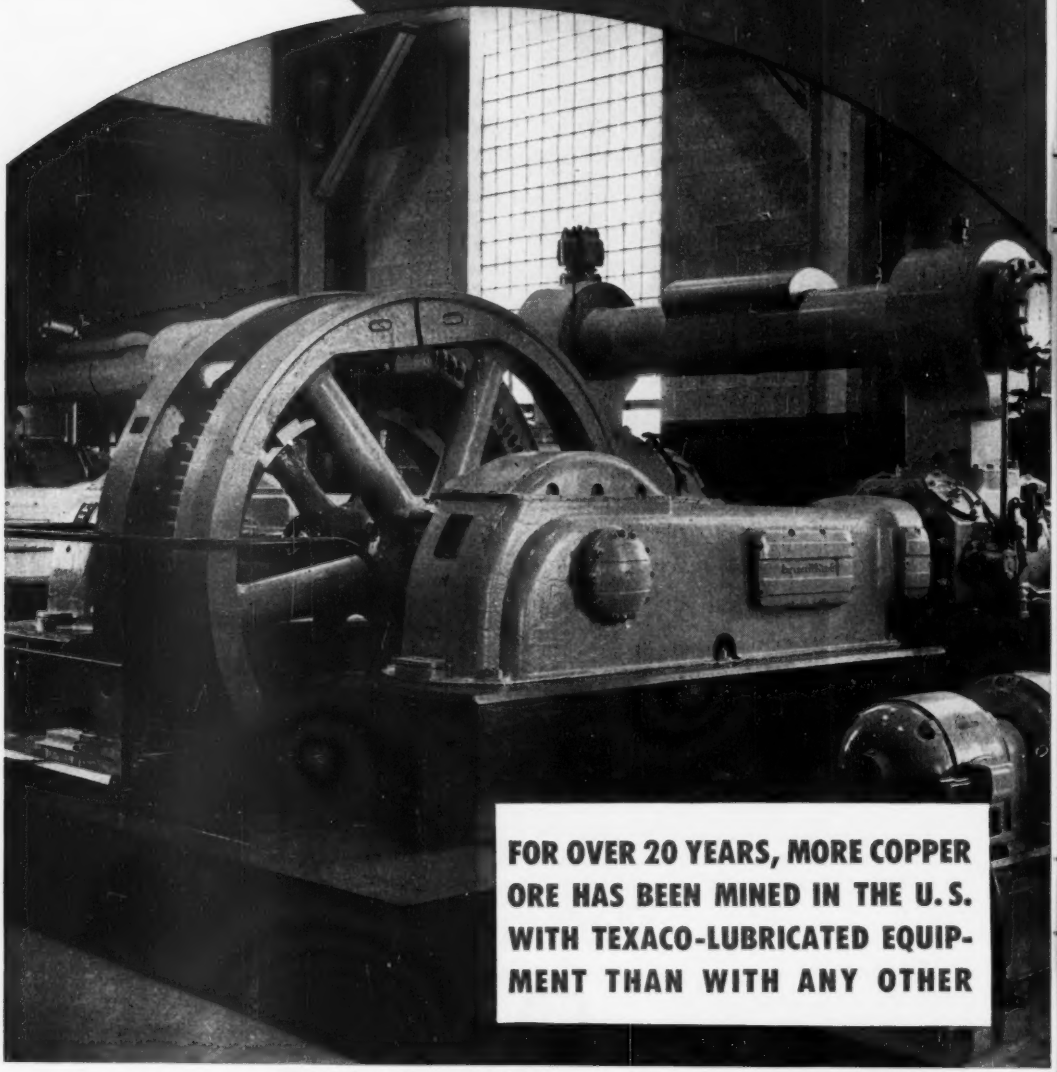

FOR OVER 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U. S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE, on television Tuesday nights. METROPOLITAN OPERA radio broadcasts Saturday afternoons.

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Use the recommended Texaco air compressor oil

You can keep full air pressure at your drills only by keeping your compressors running cleanly and efficiently. Here you must depend on effective lubrication . . . and because *no one oil* can assure this under *all* operating conditions, there is a complete line of Texaco air compressor oils . . . one exactly right for *your* conditions.

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FOR YOUR ROCK DRILLS use *Texaco Rock Drill Lubricant EP.* You get superior lubrication plus longer drill life and reduced maintenance costs because of its "extreme pressure" properties. In addition, it protects against rust whether drills are running or idle.

A Texaco Lubrication Engineer will gladly help you select the proper lubricants to get top performance from all your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
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Faithfully yours 50 TEXACO *for Fifty Years*

Now... the famous MOTOR SCRAPER joins the A-C line

In order to serve you more completely, Allis-Chalmers has extended the *Finest Line on Earth* by adding the famous MOTOR SCRAPERS and MOTOR WAGONS formerly manufactured by LaPlant-Choate. This customer-accepted line meets A-C's 4-point quality requirements in every way.

These big self-propelled units are *designed for your job . . .* easy loading, high-speed hauling and quick, clean ejection. They're *built to take it . . .* job-tested, job-proved through years of use all over the world. Like Allis-Chalmers other earthmoving equipment, the MOTOR SCRAPER is *easy to operate . . . simple to service.*

Today's jobs require a more careful selection of equipment. That's why you'll be money ahead if you make your nearby industrial A-C dealer your headquarters for crawler tractors, motor graders, MOTOR SCRAPERS and MOTOR WAGONS. Stop in soon to discuss your job requirements and see his complete parts and service facilities.

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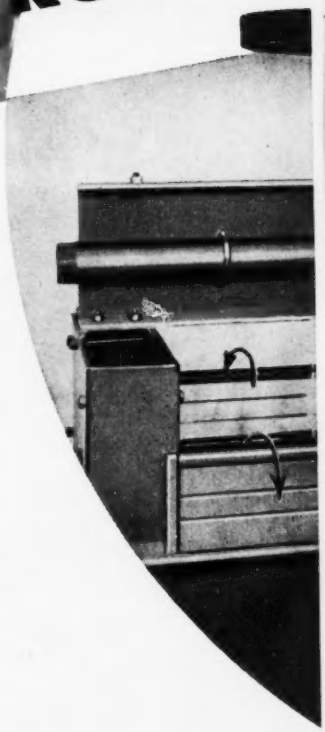
the Finest Line on Earth

TODAY'S *New* FLOTATION FOR ROUGH

... by today's leader in flotation engineering



New Denver "Sub-A" Super-Rougher Flotation Machine gets you more values from roughing and scavenging circuits

You get more profits from your ore with the NEW Denver "Sub-A" Super-Rougher Flotation Machine—developed especially for low-grade ores. Yesterday's tailings may be today's profits, because of the price of metal. The Denver "Sub-A" Super-Rougher Flotation Machine is designed to get these extra profits out of your scavenging and roughing circuits!

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Controlled feed to the agitation chamber, supercharged aeration, an adjustable sand relief opening, and controlled pulp level give the flexibility in this low level, double overflow flotation machine that your flotation engineer *must* have for maximum results and profits.

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OUR 25TH YEAR OF FLOTATION ENGINEERING

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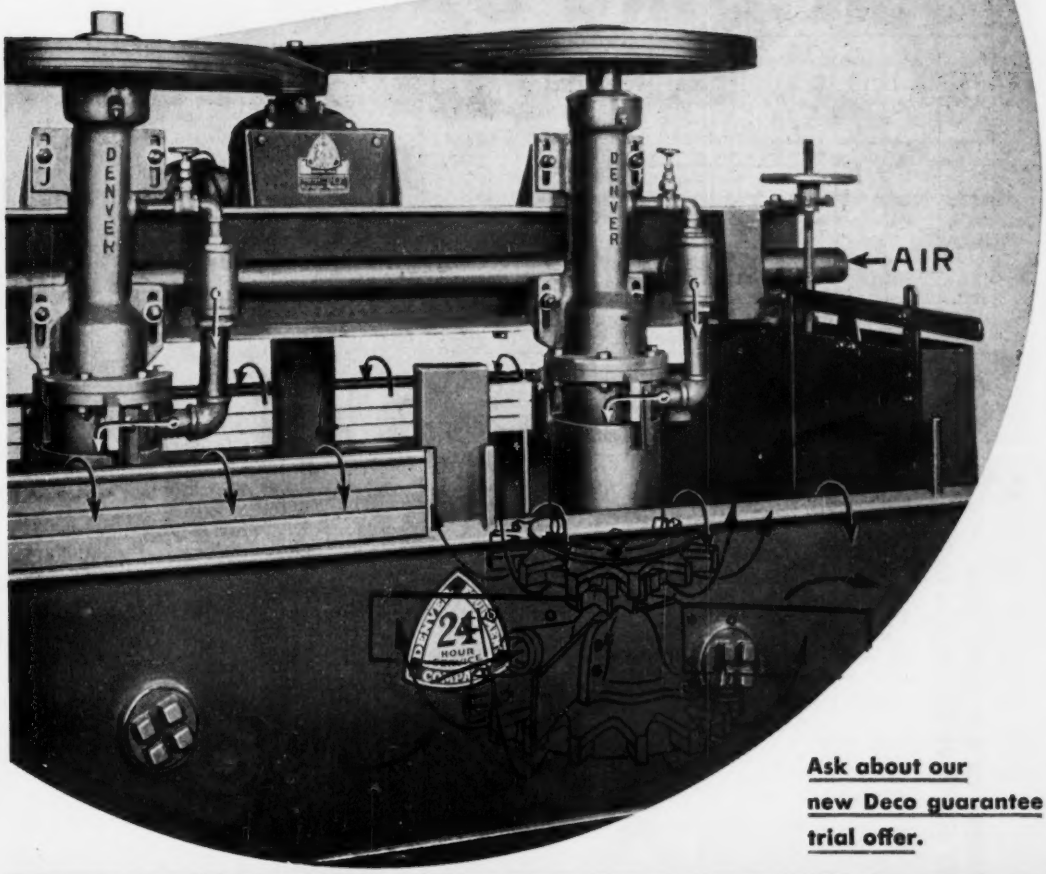

Ask about our new Deco guarantee trial offer.

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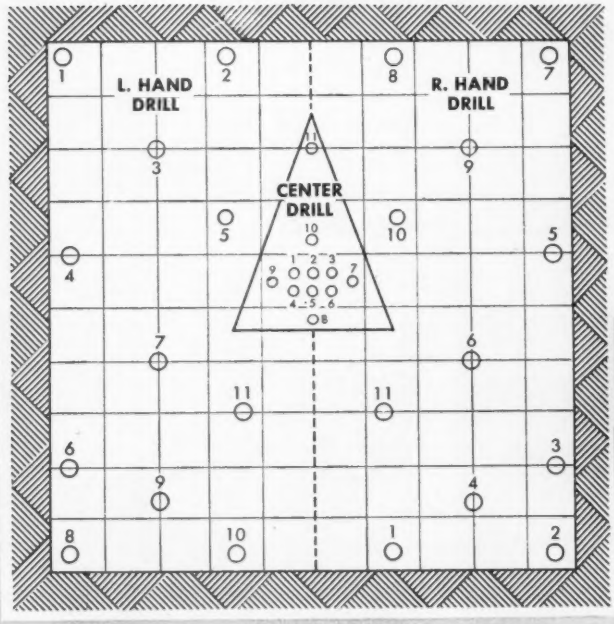
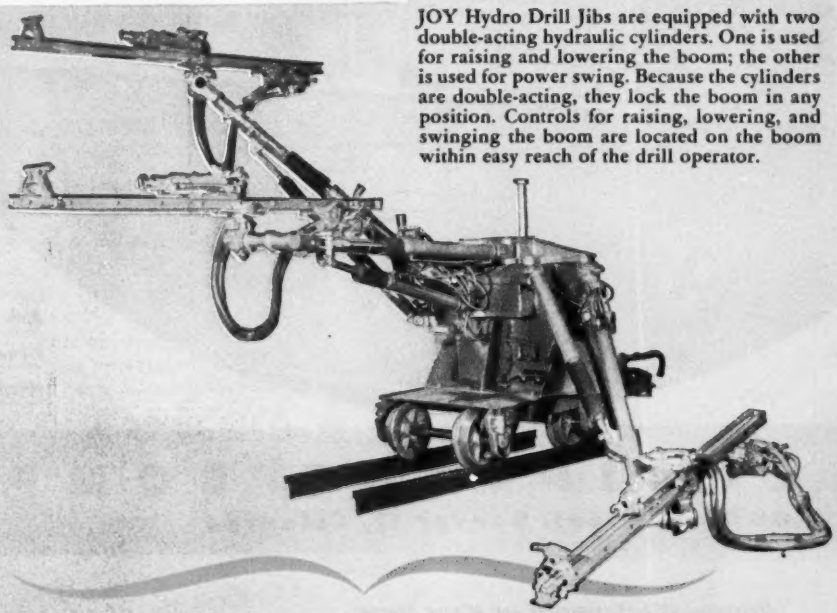
"DRILL OUT THIS ROUND"

said the Joy Engineer



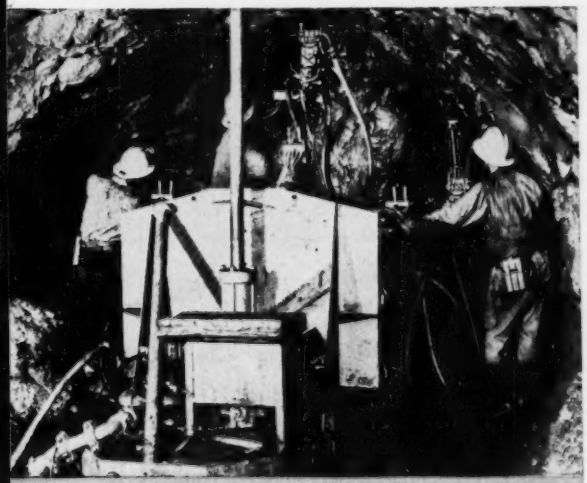
JOY Hydro Drill Jibs are equipped with two double-acting hydraulic cylinders. One is used for raising and lowering the boom; the other is used for power swing. Because the cylinders are double-acting, they lock the boom in any position. Controls for raising, lowering, and swinging the boom are located on the boom within easy reach of the drill operator.



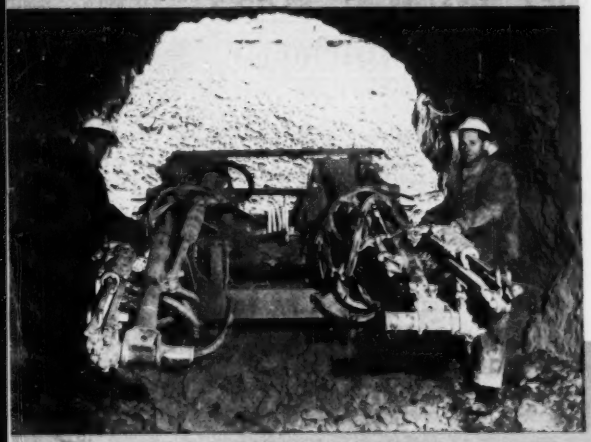
MAXIMUM VERTICAL RANGE WITH VARIOUS LENGTH BOOMS: 10 to 14 FEET

MAXIMUM LATERAL RANGE WITH VARIOUS LENGTH BOOMS: 18 to 28 FEET

"IN RECORD TIME and WITH LESS EFFORT with JOY HYDRO DRILL JIBS"



On the job in a heading: a JOY Jib Jumbo mounting three Hydro Drill Jibs with JOY T-300 drifters.



JOY builds a complete line of Jib Jumbos and Drill-mobiles. Above: a twin-boom JOY Drillmobile, rubber-tired and self-propelled for quick, easy mobility.

The recommendation above was made by one of Joy's drill mechanization specialists. He made it to a mining company which is now a satisfied user of the equipment recommended: four Joy Jib Jumbos (see facing page) each mounting three Joy T-300 Drifters on LW-6A long chain feeds. He went on to say—

"The LW 6A feed, easily supported by the Hydro Drill Jib, has an overall travel of 8 feet with a steel change of 6 feet. Thus, the proposed round can be drilled with one length of steel."

He then proposed and fully explained a drilling pattern (again see facing page) for a 10′ x 10′ round, showing the location of the eleven holes to be drilled by each one of the three jib-mounted drills. Basically, the plan provided for the least interference, and the maximum amount of drilling without dumping or swinging the drills. The holes for each drill were numbered so that the spreads between gave the runners plenty of working room. He closed by saying—

"The purpose of this proposal is to describe the many advantages of Joy fully automatic Hydro Drill Jibs. Joy pioneered the hydraulic drill jib and is still maintaining the lead in the design of this type of rig. We are keeping ahead with sound, practical improvements, and today believe we produce the finest drilling equipment available."

● Why not let a Joy drill mechanization specialist look over your problem and solve it the way he did this one? *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

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do you want to cut operating costs?

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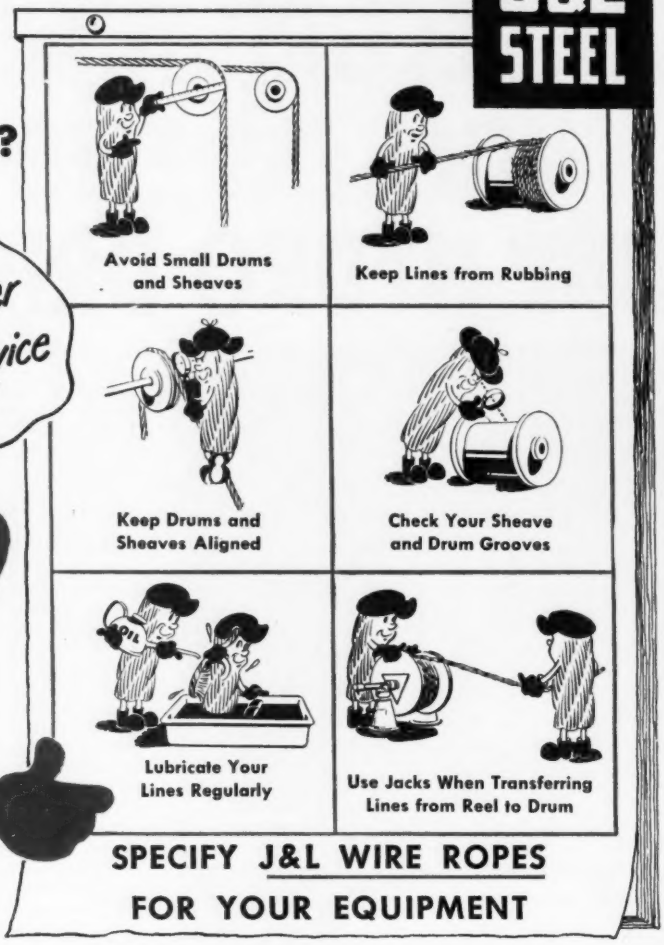
Avoid Small Drums and Sheaves
Keep Lines from Rubbing
Keep Drums and Sheaves Aligned
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Use Jacks When Transferring Lines from Reel to Drum

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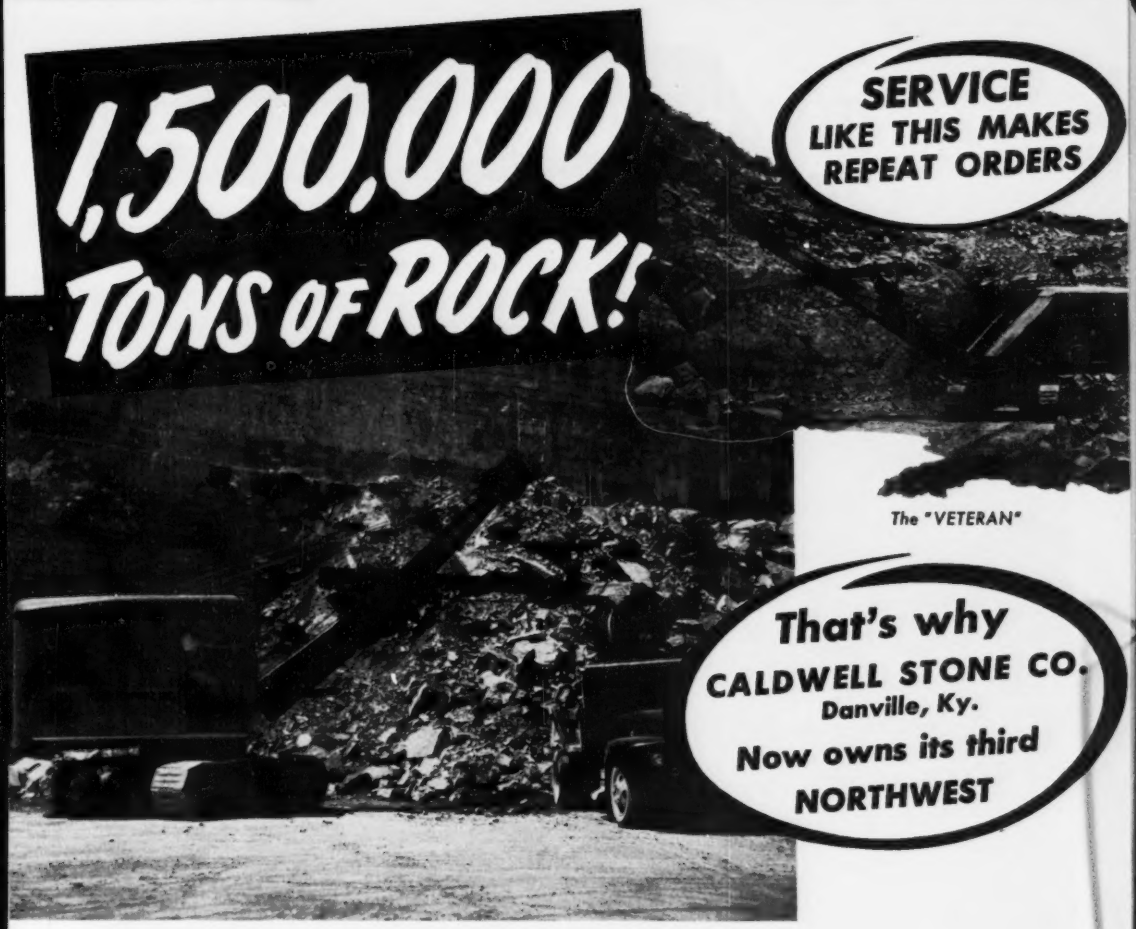

The "VETERAN"

That's why CALDWELL STONE CO. Danville, Ky. Now owns its third NORTHWEST

● The old Northwest veteran, above, was first sold in 1926 and has worked steadily all its life. It had already seen extra years of hard service when it was bought by Caldwell Stone Co. of Danville, Ky., in 1934, eighteen years ago. With Caldwell Stone it is known to have handled upwards of a million and a half to two million tons of rock since that time. In the 26 years of this Northwest's busy life, three million tons of output would be a conservative estimate.

The owner's say, "It still does a *man's* job and we use it a great deal, especially when we have *something tougher* than usual to handle." (we're talking about a 26 year old rig)

These are among the things that have made so many Northwest repeat orders. That is why a new Model 25 Northwest (the one in the lower picture) is working now in the Caldwell pits.

You can plan to have this type of service and machine life too. If you have a *real* Rock Shovel you never have to worry about output in any digging. Talk it over with our sales agent or a Northwest Man.

NORTHWEST ENGINEERING COMPANY • 135 South LaSalle Street, Chicago 3, Illinois

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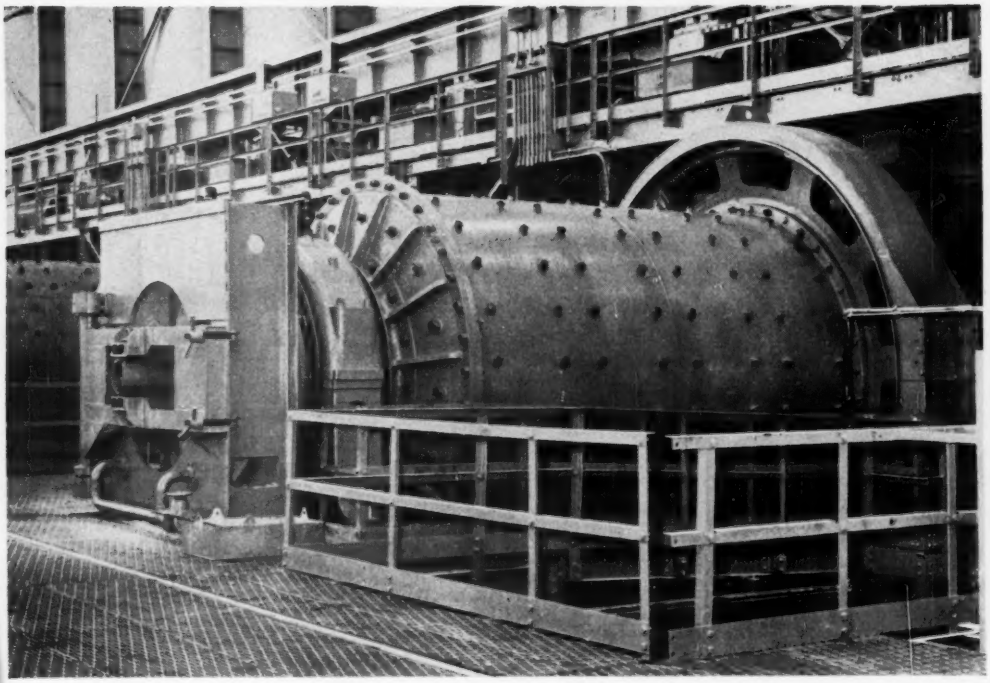
Convertible for any Mining Material Handling or Excavation Problem

at "Chuquicamata" too,



The following M & S and CIW equipment is being used in this new installation:

10—10′ 8″ x 14′ Marcy Open End Rod Mills in open circuit for primary fine crushing, producing feed for regrind mills.

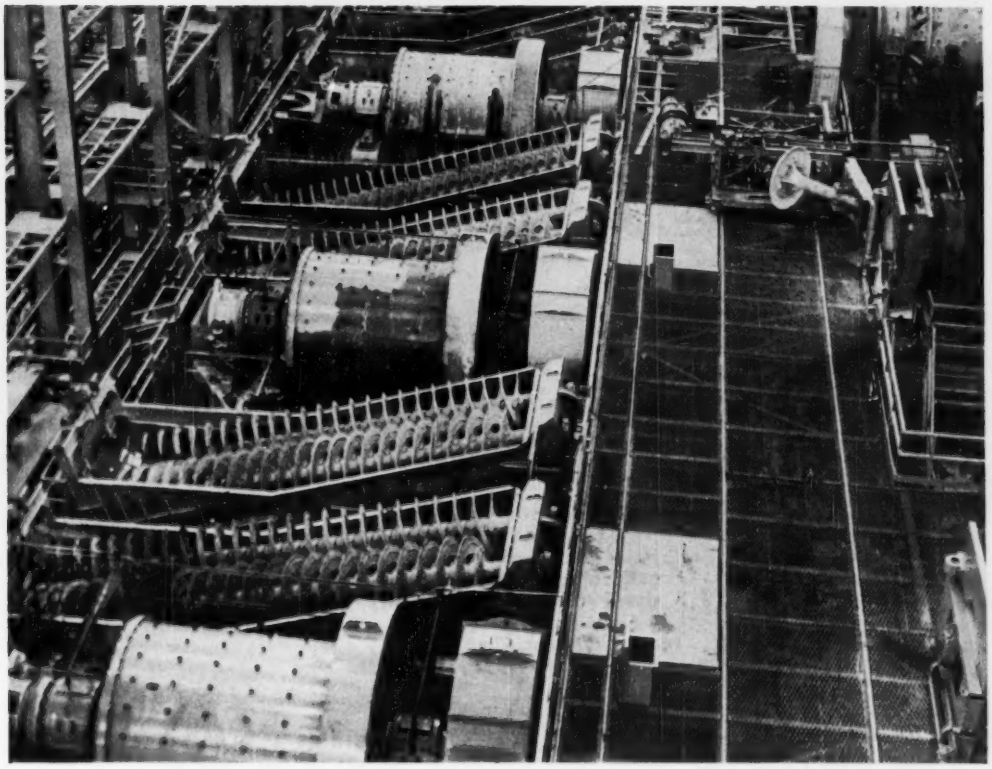
10—10′ x 12′ Marcy Regrind Ball Mills in closed circuit with 20—54″ Akins Duplex Submerged Spiral Classifiers.

6—6′ 7″ x 12′ Marcy Ball Mills operating as concentrate regrind mills and lime mills.

it's

MARCY MILLS AND AKINS CLASSIFIERS

Like many other successful mining companies, Chile Exploration Company relies on Marcy Mills and Akins Classifiers for dependable mechanical operation and efficient, low cost grinding and classification.



Let our engineers show you the reason why so many companies choose Marcy and Akins... proved results from all kinds of grinding and classification installations.

The Mine & Smelter Supply Co.

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COLORADO IRON WORKS CO.

Denver 2, Colorado

Sales Agents and Licensed Manufacturers in Foreign Countries

Two men on a treadmill

worked hard to grind a small quantity of ore with this 16th century rig. A historical curiosity today, it was once considered a highly efficient machine.

The Traylor TC Gyratory, with its curved concaves and bell head, incorporates proven principles of advanced crusher design. Bulletin 126 illustrates its superiority in detail.

A comparison of the past with the present illustrates the great progress made in finding new ways to do a job better . . . make work easier. For 50 years, Traylor has taken a leading part in developing more efficient machinery for crushing and grinding ore. By working closely with the mining industry, we have "Traylored" our equipment to keep ahead of its most exacting demands. The key to designing outstanding machinery is experience. Traylor has experience . . . half a century of it.

OUR GOLDEN ANNIVERSARY YEAR
1902 1952

TRAYLOR ENGINEERING & MANUFACTURING CO.
1472 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York, Chicago, San Francisco
Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

a **Traylor** *leads to greater profits*

FORMULA FOR SUCCESS:

"Good operators and 'Caterpillar' equipment"

Rough-and-ready big yellow units and skilled operators. Omer Snyder, president of the Snyder Construction Co., Asbury, Mo., regards these as basic ingredients for success.

"I think 'Caterpillar' equipment is the best there is," he reports. "For hard rock and mud the D8 and No. 80 Scraper stand tough abuse, load large rocks, and dispose of them easily. I owe my success to good operators and 'Caterpillar' equipment."

Here's what convinced Mr. Snyder. In hauling overburden and ore from an open pit zinc and lead mine, his five D8s with Scrapers averaged 100 tons of ore an hour on an 800-foot haul. Shovel-loaded, they averaged 80 tons an hour. They carried a load of 15 pay yards per trip.

The D8s and Scrapers were doing what comes naturally. Being cable operated, the scraper can pump dead material. Its positive ejection gets rid of the load quickly and evenly. Loading and unloading fast . . . that's economy.

"Caterpillar" Diesel Tractors and Scrapers are built to last. And they'll stay that way if you insist on genuine "Caterpillar" parts and service. See your "Caterpillar" Dealer today.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

Two model 12B Eimco loaders loading in 26° incline shaft at Ophir Mine.

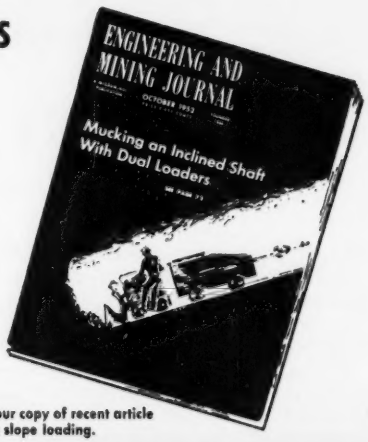
EIMCO SLOPE LOADERS
SPEED UP SINKING ON INCLINES

Eimco standard loaders equipped with Eimco patented slope loading attachments save time on incline loading jobs.

Loaders equipped for slope loading are at work in various mining districts. When specifications are furnished, the machine is furnished completely equipped to operate on your slope. Operators wishing to convert their standard machines for slope loading will receive detailed instructions.

Slope loaders may be easily converted for level loading when the slope is completed.

Write for more information.



Write for your copy of recent article on slope loading.

EIMCO

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3,500,000-plus tons *and still going strong!*

When the G.T.M.—Goodyear Technical Man—was called in to specify a conveyor belt for this asphalt mixing plant, wartime demand prevented redesign of the loader to eliminate too-close clearance which was grinding sharp, abrasive rock into the belt.

In spite of the belt-killing abrasion, the Goodyear Style B conveyor belt he installed has been going strong in service which would have quickly destroyed most belts—more proof that Goodyear's design-for-the-job means outstanding conveyor belt service.

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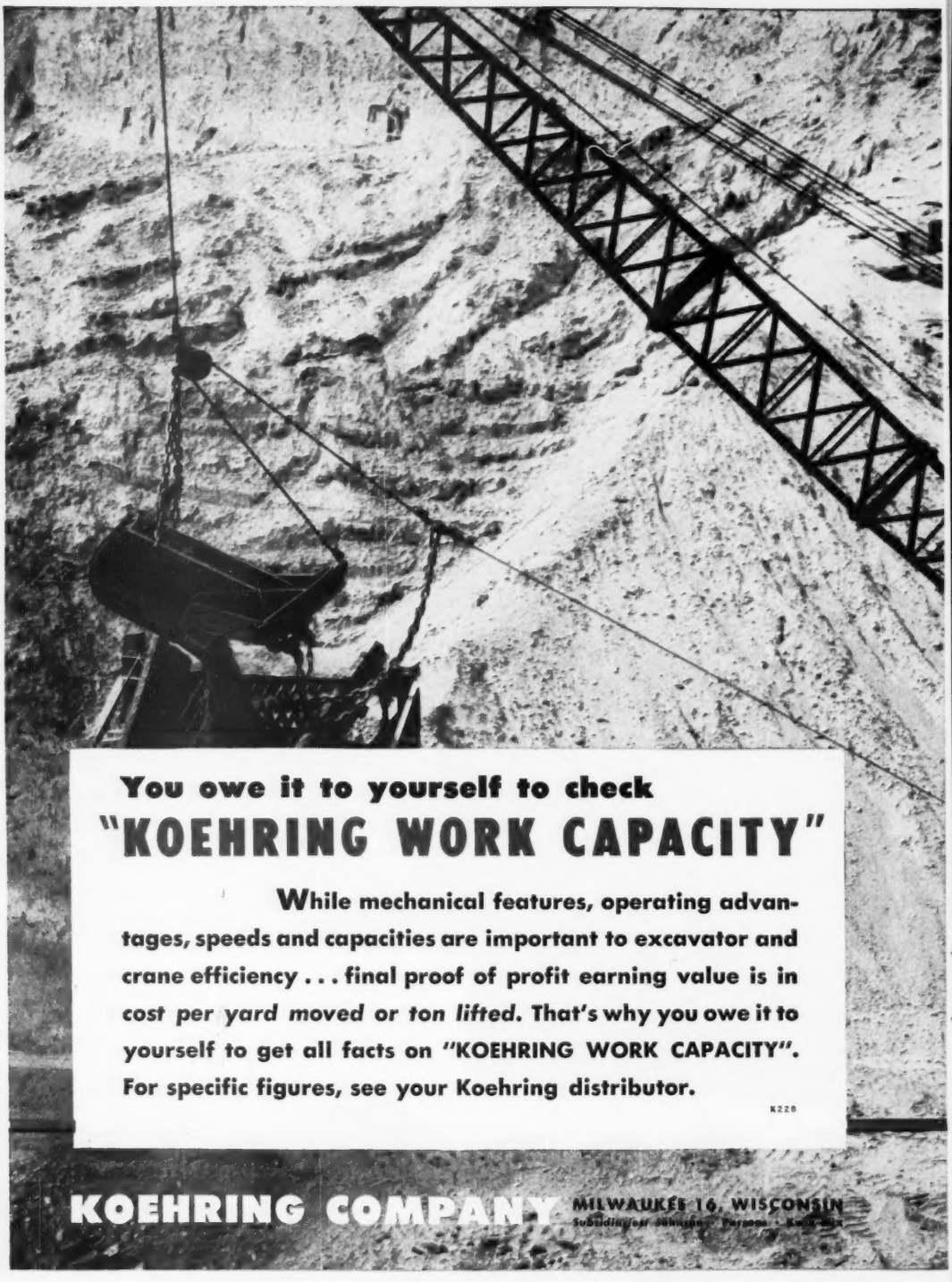
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While mechanical features, operating advantages, speeds and capacities are important to excavator and crane efficiency . . . final proof of profit earning value is in *cost per yard moved or ton lifted.* That's why you owe it to yourself to get all facts on "KOEHRING WORK CAPACITY". For specific figures, see your Koehring distributor.
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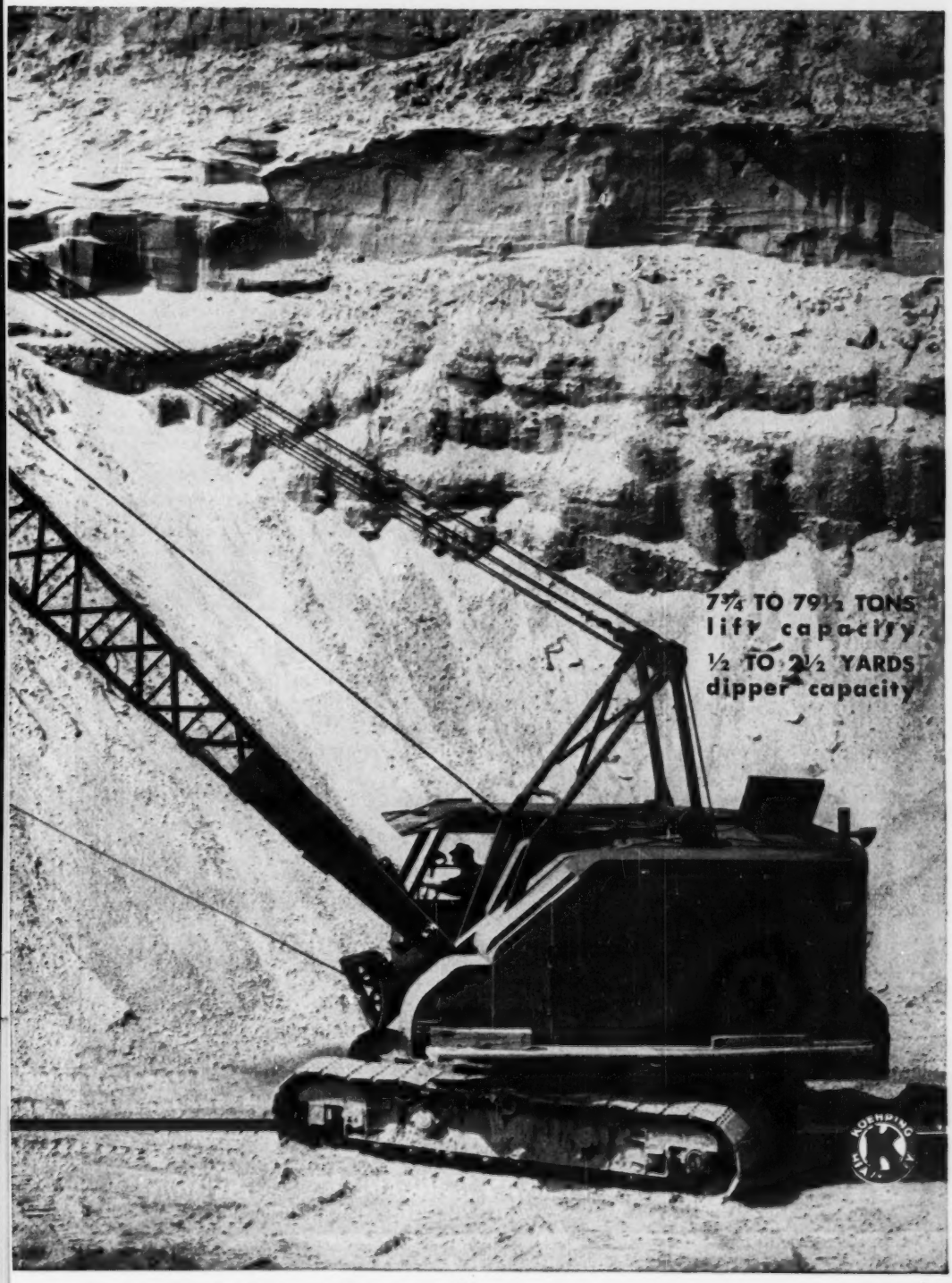
7¾ TO 79½ TONS
lift capacity
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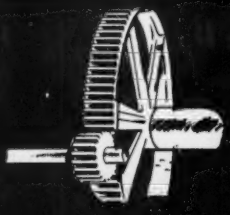
The Right Way to Say Hard-facing for every Industrial Use

AMSCO TOOLFACE for metal to metal wear up to 1000 F. Deposits have high abrasion and impact resistance. All diameters bare and coated. Microstructure: martensitic steel.

AMSCO TUBE TUNGSITE (coarse particles) is best suited for applications requiring highly efficient cutting qualities, for hardfacing earth working and drilling equipment used for cutting extremely hard compositions, for hardfacing applications requiring a serrated edge and hard-facing certain types of earth working equipment or parts subject to extreme abrasion.



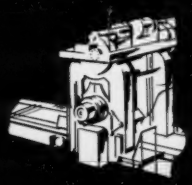
AMSCO HF-60 for moderate impact and abrasion and has outstanding weldability particularly for vertical applications. All diameters, coated only. Microstructure: martensitic steel.

AMSCO FARMFACE or AMSCO CHROMEFACE for farm or industrial use. Excellent resistance to low stress sliding abrasion. All diameters, bare and coated. Microstructure: a high chromium austentitic iron containing manganese and silicon, and consisting of hard chromium carbides in a matrix of austenite.

AMSCO No. 217 for abrasive service up to 1000 F. All diameters, bare and coated. Microstructure: an air hardening martensitic iron alloy containing chromium and tungsten.

AMSCO HF-40 for severe abrasion, moderate impact. Deposits have excellent weldability. All diameters, coated only. Microstructure: martensitic cast iron.

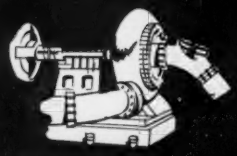
AMSCO AIR-HARDENING for abrasion and severe impact. Deposit can be forged to sharp edge without loss of hardness. All diameters, bare and coated. Microstructure: martensitic steel.



AMSCO AW-79 will meet most requirements for better control of wear where abrasion and impact are important factors—plus all the advantages of automatic welding. Especially suitable for rebuilding and hardfacing tractor rollers, steel wheels, sheeting rolls; dredge pins, as well as dozens of other automatic applications. 3/32" and 1/16" in 22½" ID., 100 lb. coils.

AMSCO V-MANG, bare or coated, for build up and repair on manganese steel castings exposed to impact; work hardens—3/32", 5/16", 1/4". Microstructure: austenitic manganese steel.

AMSCO CO-MANG, coated only, for build up and repair of manganese steel castings exposed to severe impact. Deposit has excellent impact resistance; work hardens—1/8", 3/32", 5/16", 1/4". Microstructure: austenitic manganese steel.



AMSCO TUNGROD (fine particles) is best suited for applications requiring highly efficient cutting qualities, for hardfacing earth working and drilling equipment used for cutting extremely hard surfaces or formations, for hardfacing applications requiring a thin edge or small point, for hardfacing certain types of equipment or parts subject to extreme abrasion.

AMSCO ECONOMY HARDFACE "C" for abrasion resistant service and severe impact. All diameters, coated only. Microstructure: martensitic steel.

AMSCO No. 1 and AMSCO No. 6 for combination of corrosion and abrasion or for 1000 F service and above. No. 1 has greater abrasion resistance; No. 6 is tougher and can be machined. All diameters, bare and coated. Microstructures: No. 6 contains an eutectic carbide mixture in a solid solution matrix, while No. 1 contains large hard wear-resistant chromium carbide crystals scattered through a solid solution matrix.

AMSCO No. 459 for severe abrasion, mild impact. Excellent abrasion resistance. All diameters, bare and coated. Microstructure: martensitic cast iron containing chromium and molydenum, consisting of hard carbides, austenite and martensite.

To get the right answer, detailed analyses, and other pertinent information, concerning your wear problem, write for catalog 650W or contact your nearest Amsco Distributor.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

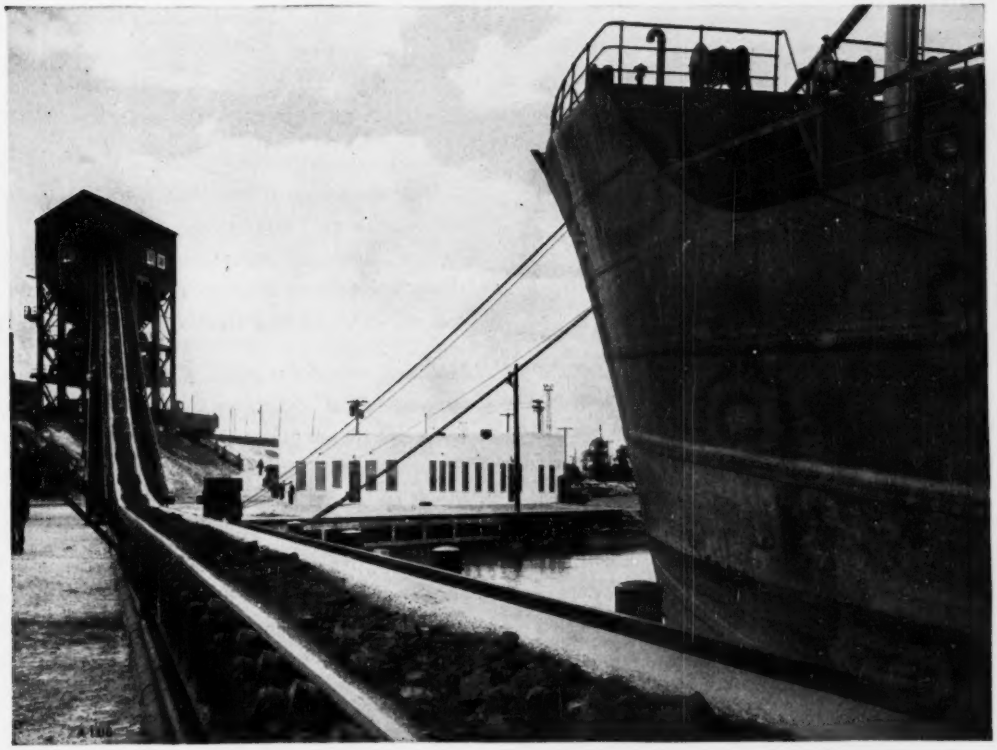
Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

S-A CONVEYING *Systems* for moving ore by the **SHIPLOAD** or **TRAINLOAD** with speed and economy

A shipload is "a lot of ore".

To move it from the ship to a string of railroad cars some 900 feet away, at a rate of 2,000 tons per hour, is no small task. However, S-A engineers are highly skilled in the art of solving these problems—from drawing board to reality. That is why industry has turned to them consistently for conveying systems designed and equipped to give efficient, low cost handling of bulk materials.

An S-A engineer represents 50 years of experience plus a complete line of equipment . . . he is well qualified to talk to you about bulk ore handling problems. Write us for full details . . . no obligation.



Belt Conveyors
Belt Trippers
Belt, Pan & Plate Feeders
"AMSCO" Steel Pan Feeders
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REDLER Conveyor-Elevators
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Write for a bulletin on any of the above

Baltimore and Ohio cars wait on a double track rail spur to receive a complete shipload of imported ores within 24 hours of ship arrival at the new ore docks at Curtis Bay, Maryland. The S-A installation features a four foot wide belt conveyor and several manganese steel pan feeders.

STEPHEN S-A DAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

"CONSOLIDATION COAL"

...with 2 rubber-tired Tournadozers

Consolidation Coal Company, (Ky.), a division of Pittsburgh Consolidation Coal Company, operates 4 mines and 2 preparation plants within a 20-mile radius of their offices at Jenkins, Kentucky. One of their 2 rubber-tired C Tournadozers handles all clean-up work at their "Beefhide" spread . . . the second "C" is on standby duty to handle emergency jobs at *all four* mines and the Jenkins Preparation Plant. This rubber-tired unit drives to the scattered job locations under its own power . . . travels over paved highways, limestone and red-dog surfaced mine roads, across tracks, up and down 20% grades at speeds up to 19 m.p.h. It is ready to go *anywhere* at a moment's notice. No blocking, loading or unloading delays at any time! With high speeds on rubber, it puts spare time to work . . . drains refuse areas . . . strips overburden . . . hauls equipment on low-bed trailers . . . handles many other odd jobs.

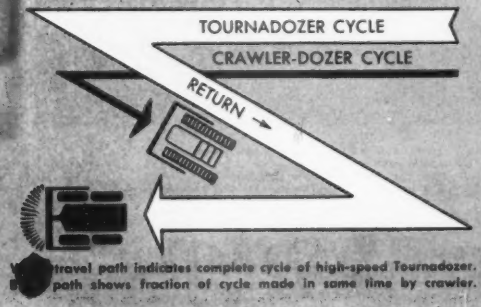
Saves 1" to 2" of coal on clean-up work

On clean-up assignments, Tournadozer's low-pressure tires reduce coal waste . . . don't dig coal into the ground or grind it into unrecoverable fines. At the "Beefhide" mine, for example, Consolidation's Tournadozer saves an estimated 1" to 2" of coal on its continuous cleaning operation.

Mobile Tournadozer gives "Consolidation" important *mechanical* advantages, too! 186 h.p. engine and 4-wheel drive put plenty of power behind the rugged 2½-yard blade. Instant-shift selection of 4 forward speeds saves vital momentum . . . lets operator drift loads in higher gears. Reverse speeds to 8 m.p.h. cut non-productive time on return half of cycle for more passes per hour. Big 21.00 x 25 low-pressure tires give plenty of sure-footed traction in soft material. Powerful 4-wheel, disc-type air brakes assure fast, safe control at all times.

Your LeTourneau Distributor will be glad to show you the Tournadozer in action, so you can judge these advantages for yourself. Call him next time you're considering dozers.

High speeds, instant shift cut non-productive time



travel path indicates complete cycle of high-speed Tournadozer. path shows fraction of cycle made in same time by crawler.

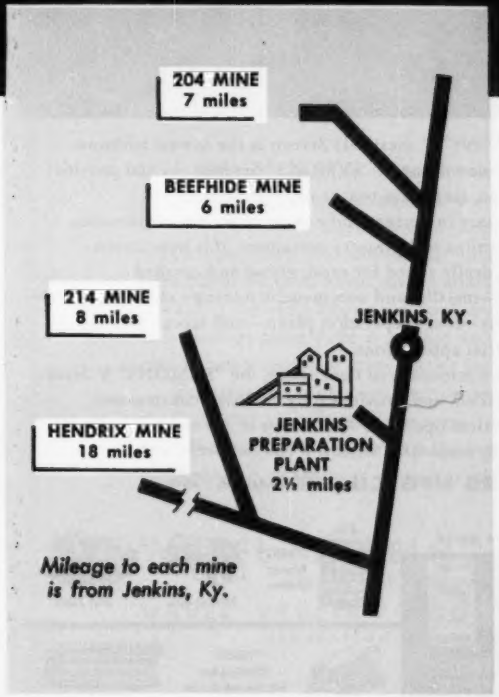
Tournadozer's instantaneous speed selection permits faster travel after blade is full . . . immediate reversal of direction for faster dozing cycles. Result — more jobs handled per shift.

Tournadozer—Trademark Reg. U. S. Pat. Off. D-32-CM

R. G. LeTOURNEAU, INC.
Peoria, Illinois

HIGH-SPEED, RUBBER-TIRED EXCAVATING

SERVICES 4 MINES...



At the Hendrix mine slate dump, Tournadozer pushes its load of truck-dumped slate 75' in 2nd gear (3.7 m.p.h.) . . . returns to dumping point in high reverse (8 m.p.h.).

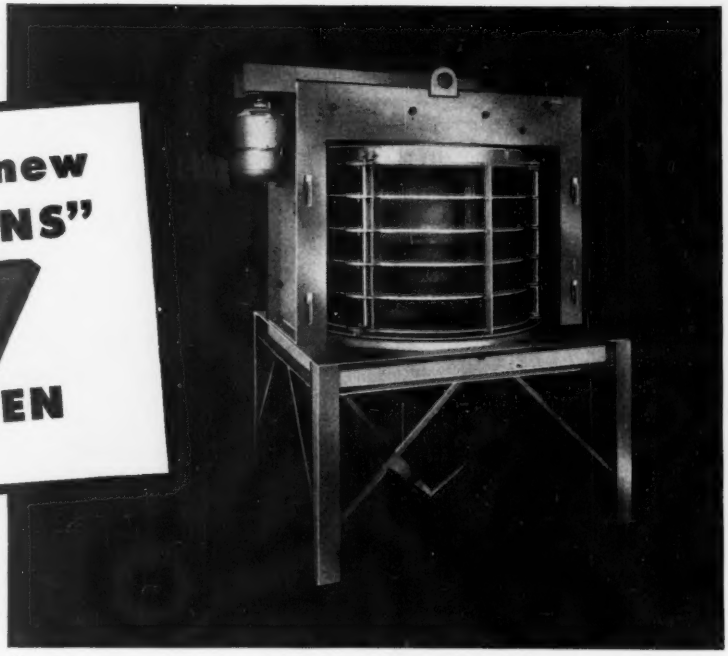
Tournadozer works on loose spoil banks or hard-packed coal seams without damaging coal surface . . . completes dozing cycles in ½ to ⅓ the time required by crawler-tractors.

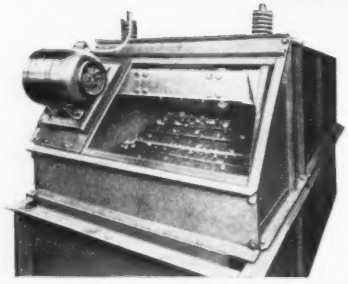
HAULING • LIFTING EQUIPMENT

ROBERT G. LETOURNEAU EQUIPMENT

Here is the screen you need for extremely *fine* separations

...the new "SYMONS" V SCREEN





"SYMONS" ROD DECK SCREEN . . . employs a highly efficient screen deck, utilizing individual replaceable spring steel rods. Features low screening cost—big capacity—low maintenance—long life—ideal for moist and sticky materials.

THE "SYMONS" V (vertical) Screen is the newest addition to the well-known line of "SYMONS" Screens . . . and provides extremely fine, single cut wet or dry separations.

Revolutionary in design, and operating with a combination of centrifugal action and gyratory movement, this new screen has proved ideally suited for sand, gravel and crushed stone plants—metallic and non-metallic mining—chemical plants—cement plants—coal preparation plants—and scores of other industrial applications.

Requiring a minimum of floor space, the "SYMONS" V Screen is easily installed, and provides fully enclosed construction to assure dustless operation—yet access to the screen is simplified through easily removable covers. *Write for further details.*

NORDBERG MFG. CO., *Milwaukee, Wis.*

S252

"SYMONS" . . . a Nordberg trade mark known throughout the world

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MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

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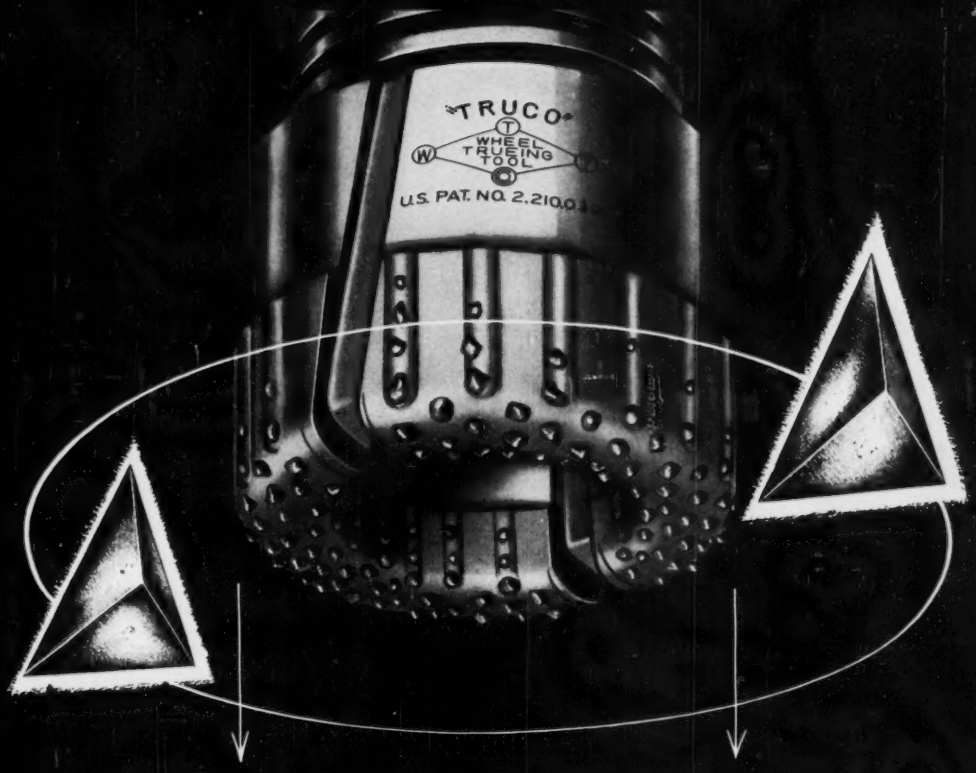
"SYMONS" Primary Crushers

Grinding Mills

Mine Hoists

"SYMONS" Vibrating Bar Grizzlies and Screens

Diesel Engines



ATOMIC SCIENCE FOR DRILLERS

Every driller should know this much about atomic science; the diamond is the world's greatest cutting element because of its atomic structure.

It starts with a diamond atom shaped like one of the pieces shown above—a tetrahedron. Even the tiniest, fine industrial diamond contains billions of these tetrahedron diamond atoms, always arranged in the same crystalline formation, always producing the same atomic structure, and always with one important peculiarity: At each cleavage plane there is a "hard vector" or "rib" which is harder and has more cutting power than any other part of the diamond.

For centuries, it has been the objective of good diamond setting practice to locate the "rib" and set it "toward the work," as is done today in setting Truco Diamond Drill Bits, so that the driller gets the benefit of the diamond's utmost cutting power —delivered in the form of maximum footage at minimum cost.

WHEEL TRUEING TOOL COMPANY

3200 W. DAVISON AVENUE, DETROIT 6, MICHIGAN

WHEEL TRUEING TOOL CO. OF CANADA, LTD.

575 LANGLOIS AVENUE, WINDSOR, ONTARIO, CANADA

Shield and slotted bolt partially expanded, after insertion in hole.

Fewer Roof-Fall Accidents *WHEN YOU ROOF-BOLT*

Roof-fall accidents are less likely to occur when roof bolting is used. This is because the roof bolts, anchored at their upper and lower limits, consolidate varying layers of strata into a single-unit, thick beam. Roof bolting also increases the operating efficiency of the mine by eliminating timber supports, thus providing larger floor areas in which to operate mechanized equipment. It makes possible faster transportation and improved ventilation, and is economical because the bolts hardly ever need maintenance.

To help operators obtain these ideal conditions, Bethlehem produces the two types of roof bolts described below. These bolts are made from new-billet steel in a wide variety of lengths. They can be installed vertically or at angles. They can be combined with roof plates, roof ties, roof channels, plate washers and angle washers.

If you would like to have detailed information about how you can use Bethlehem Roof Bolts to best advantage, write to us at Bethlehem, Pa.

BETHLEHEM SLOTTED ROOF BOLT. One end of bolt has forged slot to accommodate wedge. The slot is automatically centered by an exclusive process which forms the equivalent of two half-rounds. No steel is lost through burning. The opposite end of bolt has 5 in. of 1-in. rolled threads. When driven against back of hole, the wedge is forced deep into the slot, expanding bolt ends to provide tight grip. Truncated-cone point prevents thread damage. Furnished with American Standard Regular Square Nut.

BETHLEHEM SQUARE HEAD ROOF BOLT (With Expansion Shield). This assembly consists of a special unchamfered square-head, rolled-thread, ¾-in. bolt, plug, and expansion shield. Two pressed ears on bolt shank support the shield during anchoring. When bolt is tightened, the plug is forced down into the shield, expanding the leaves of the shield to provide holding tension. Sharp projections near the top of each leaf contact the sides of hole, to prevent shield from turning when bolt is rotated.

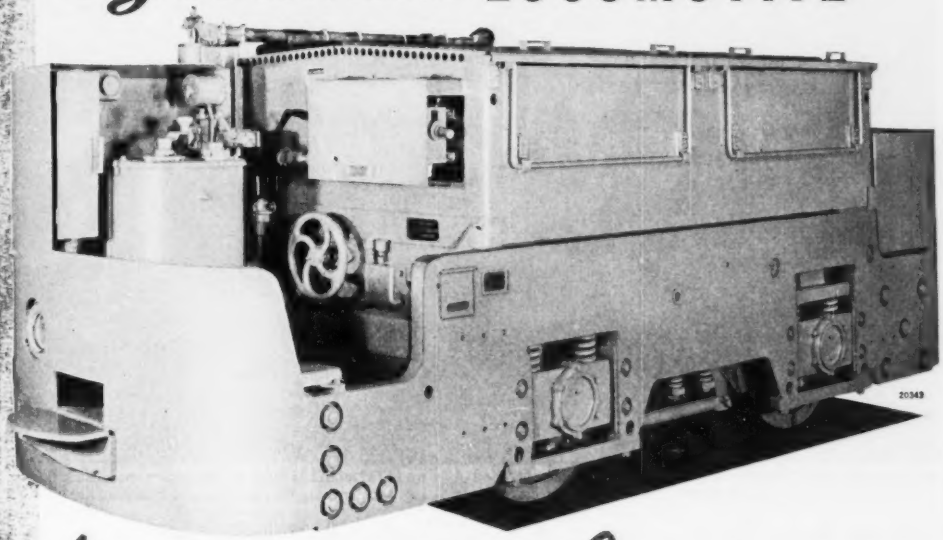
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM MINE ROOF BOLTS

A TWO-WAY PAYOFF
with this
Goodman LOCOMOTIVE



1 It's a storage battery locomotive for gathering work at chutes and haulage through rotary dump, where it is not practical to string trolley wire or trail cable.

2 It's a trolley locomotive for heavy, main line hauls. Battery is charged automatically when operating on trolley.

Chassis weight is 10 tons; gauge 36 inches; over-all height 65¾ inches; over-all length 15'. Running drawbar pull on trolley is 5000 lbs. at 7½ mph; on battery, 5000 lbs. at 3 mph. There are two 60 hp, 250 volt motors.

PRACTICAL CONSTRUCTION FEATURES:

Camtactor controller
Roller bearing axle journals
Transverse equalizer for best track performance
Hydraulic brakes
Continuous strip resistance

Plus the Goodman wet mine design for full protection of controller, motors, resistance, batteries and brake system from water and muck.

There is a Goodman trolley, storage battery or combination type to fit your job. We shall be pleased to work with you.

Just Printed:

Catalog CH-521 describing in detail the Goodman line of metal mine locomotives. Your request will bring you a copy promptly.

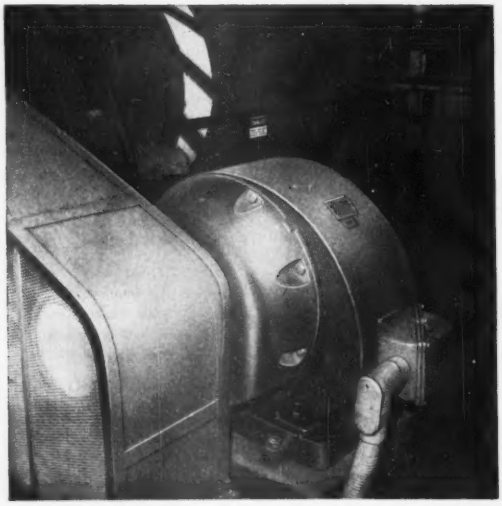
Goodman MANUFACTURING COMPANY
HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

BUILDERS OF UNDERGROUND MINE MACHINERY FOR MORE THAN 50 YEARS

ENGINEERING REPORTS:

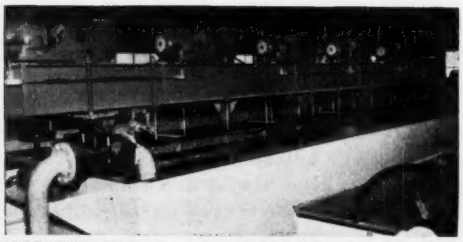
AUTOMATIC MINE HOIST at Duval—amplidyne-controlled and driven by a 600-hp G-E MDP motor—hoists 6 tons of ore up 1628 feet in 103 seconds. Maximum speed is 1100 fpm. Loading, acceleration, deceleration and dumping are all automatic.

Co-ordinated electric equipment

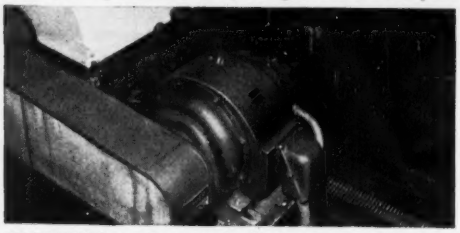


ROD MILL inside refinery is driven at 19 rpm by a 720-rpm G-E Tri-Clad* synchronous motor rated 250 hp, 440 volts.

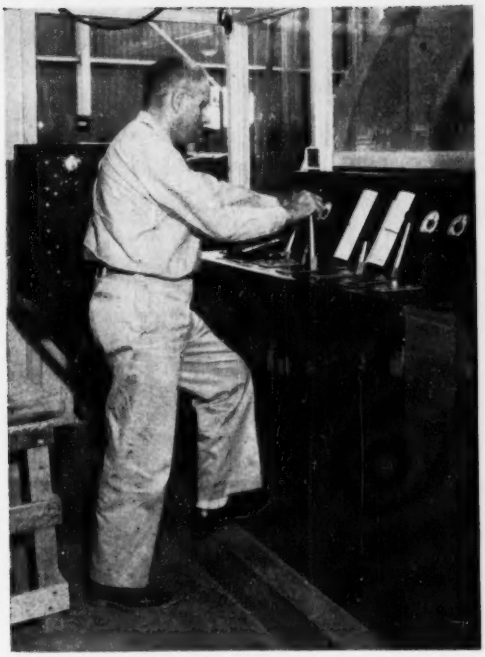
*Registered Trade-mark of General Electric Company.



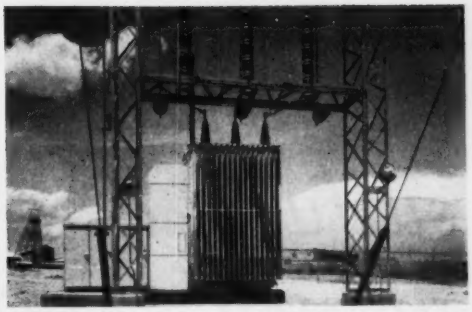
FLOTATION CELLS shown are agitated by five 5-hp G-E motors, totally enclosed, fan-cooled against corrosive vapors.



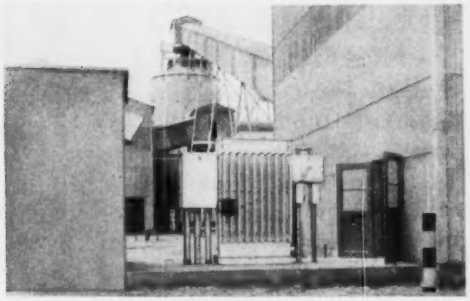
CENTRIFUGES, another step in the process, are driven by these 150-hp G-E Tri-Clad wound-rotor motors.



CONTROL OF MAIN ORE HOIST can also be manual by means of master control located in this hoist console.

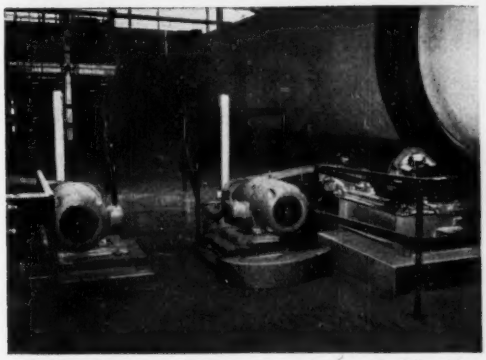


POWER purchased by Duval is stepped down from 67,000 to 4160 volts at this G-E 5000-kva master unit substation.



DEPENDABLE G-E TRANSFORMERS step down 4160 volts to 480/277 volts grounded-neutral at 6 utilization areas.

keeps Duval potash output high



DRYING KILNS, where the refined potash is prepared for shipment, are driven by 40-hp G-E totally enclosed motors.

System engineered for efficient operation of automatic hoist and refinery drives

Typical of the way General Electric helps mining companies handle high tonnages at low cost is the new potash mine and refinery of the Duval Sulphur and Potash Company at Carlsbad, N. M. General Electric supplied power transformation equipment, refinery motors, and mine-hoist electric equipment.

G-E engineers—working closely with engineers of Duval Sulphur and Potash Co. and their engineering contractors, Stearns-Roger Mfg. Co.—applied this co-ordinated drive equipment to meet Duval's needs most efficiently and economically.

To put this kind of engineering leadership to work on *your* ore mining or processing problems, contact your local G-E Apparatus Sales Office—early in your planning. General Electric Co., Schenectady 5, N. Y.

660-27

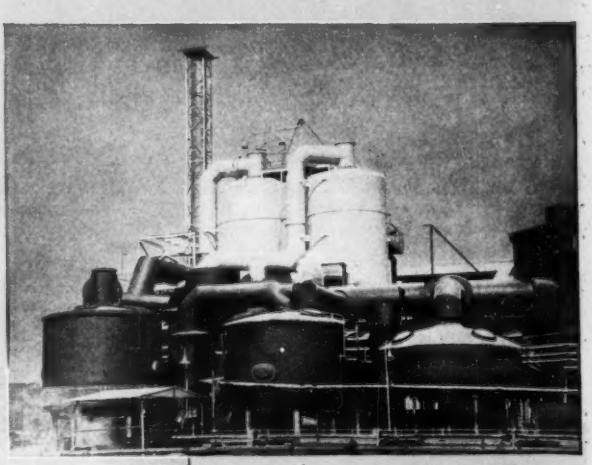
Engineered Electrical Systems for Ore Processing

GENERAL ELECTRIC

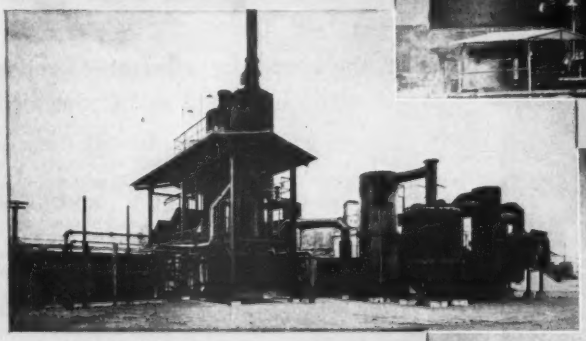
How much sulfuric acid do you need?

Among the many Chemico-built contact sulfuric acid plants in service today all over the world, one has a capacity of only five tons per day. Another produces more than five hundred tons per day. Others range in between.

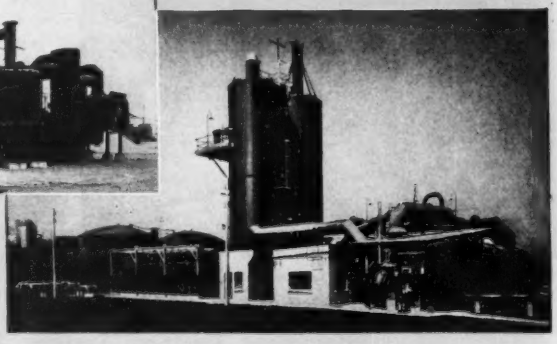
Whatever your sulfuric acid requirements are, Chemico will design and furnish you with a highly efficient plant exactly suited to your needs . . . on a one-contract, guaranteed-performance basis.



500 Tons



50 Tons



200 Tons

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

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TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICAN CYANAMID (PTY) LTD., JOHANNESBURG

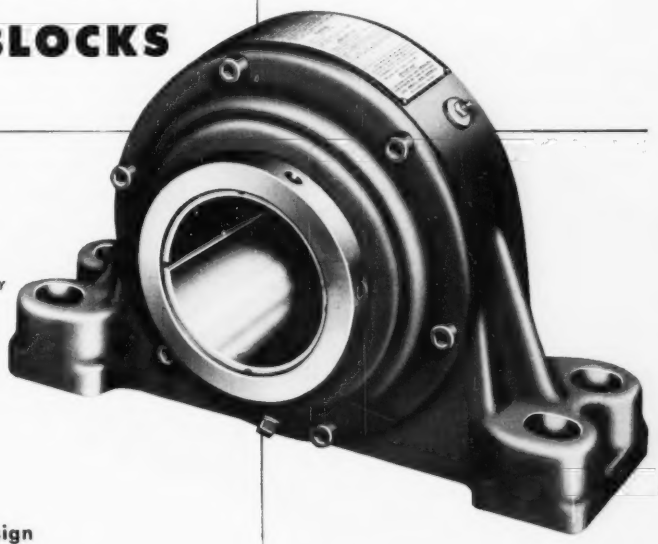
Chemico plants are profitable investments

NEW

DODGE-TIMKEN ALL-STEEL PILLOW BLOCKS

HEAVY DUTY CAPACITY!

LESS SPACE! LESS WEIGHT!



A JOINT ENGINEERING DEVELOPMENT BY DODGE AND THE TIMKEN ROLLER BEARING COMPANY

- All-Steel construction
- A new Timken bearing design
- High radial and thrust capacities
- Compact—minimum dimensions
- Minimum weight with maximum strength
- Fully self-aligning with spherical outer race
- Both expansion and non-expansion types
- Adapter mounting, proven through the years
- Double piston ring seals
- Sealed both on and off the shaft
- Fully assembled, permanently adjusted, lubricated and sealed at the factory

Here are the bearings for industry's toughest jobs. High radial and thrust capacities. Stamina to take heavy shock loads. And all-steel construction packs this load-carrying capacity into less weight and less space. Engineers are already specifying "Dodge-Timken All-Steel" for some of America's largest projects. Write for details and delivery dates, or call your Dodge Distributor.

DODGE MANUFACTURING CORPORATION
3100 Union Street, Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory-trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

DODGE

of Mishawaka, Ind.

ACCURATE, ECONOMICAL BENEFICIATION

of many low-value

NON-METALLIC AND METALLIC OXIDE MINERALS

now practical with

CYANAMID 800 SERIES FLOTATION REAGENTS

and PROCESSES

Originally developed to beneficiate iron ore on the Mesabi, Cyanamid 800 Series Reagents now have many diverse applications in the selective flotation of iron-bearing and other oxide minerals. Improved processes for their more effective use have steadily expanded the sphere of these economical reagents . . . both in treating – 65 mesh material directly and in making an end-product from feed that has been pre-concentrated by mechanical methods. Typical examples of what can be done are shown on the page opposite.

Cyanamid also offers the two most efficient Separation Processes by Gravity Differences (Heavy-Media Separation and the Dutch State Mines Cyclone Separator) both of which merit investigation for non-metallic mineral concentration.

More efficiently than older gravity methods, Heavy-Media Separation accurately separates valuable mineral from unwanted material in sizes down to 10 mesh when there is a difference in the specific gravities of each fraction of the feed. The Dutch States Mines Cyclone Separator is particularly applicable to low cost separation of 3/8" x 65 mesh and finer sizes. These processes, already in large-scale use in a number of plants, are successfully separating valuable non-metallic minerals from gangue, although the difference in their specific gravities may be as low as 0.05. Either can be used as a pre-concentration step or for the production of marketable products.

TYPICAL EXAMPLES OF THE EFFECTIVENESS OF CYANAMID 800 SERIES FLOTATION REAGENTS

GLASS SANDS. In the East, Middle West and on the Pacific Coast, four flotation plants with a combined feed-rate upwards of 150 tons per hour are profitably beneficiating sands containing up to 3% of such deleterious impurities as iron oxide, ilmenite, muscovite and biotite mica.

From a feed containing from 0.076% to 0.172% Fe_2O_3, a typical plant produces a finished product assaying 0.018% to 0.027% Fe_2O_3, with negligible amount of other impurities. Reagents used per ton of feed are: Cyanamid Reagent #825, 0.42 lb.; Cyanamid Reagent #801, 0.83 lb.; Light Fuel Oil, 0.4 lb.; Pine Oil, 0.2 lb., Sulphuric Acid, 0.2 lb.

FELDSPAR. Removal of biotite, tourmaline, garnet and iron oxides from feldspar ore to produce a high-grade glass spar or ceramic spar is no longer a difficult problem. Cyanamid Reagent #801 removes iron-bearing minerals; a cationic collector floats the feldspar. Typical operating results are:

PRODUCT	% WEIGHT	Analysis % Fe_2O_3	Analysis % Al_2O_3	Distribution % Fe_2O_3
Original Feed	100.00	0.506		100.0
Slimes (discard)	6.10	0.75		9.09
Flotation Feed	93.90	0.49		90.91
Concentrate #1 (Iron)	12.21	3.36		81.23
Concentrate #2 (Feldspar)	59.36	0.07	18-19%	8.30
Quartz Tailing	22.33	0.031		1.38

GARNET. Almandite, the iron-aluminum garnet, is separated from calcium-iron-magnesium silicates by a process involving the controlled feed of Cyanamid Reagent 825 with controlled acidity of the circuit to selectivity float one iron-bearing mineral from the other. Treating the tailing from Heavy-Media Separation and jigs, one flotation plant recovers 85% of the garnet in a feed averaging 12% garnet. Using only 0.4 lb./ton of Cyanamid Reagent 825, this plant produces an end-product analyzing over 98% garnet and suitable for special purposes.

BARITE. Ore containing 15-18% barium sulphate contaminated with hematite, quartz and clay can be beneficiated by de-sliming and floating in an alkaline circuit containing 2 lb./ton Cyanamid Reagent #825 and 2 lb./ton Sodium Silicate. End product averages 95% barium sulphate – a grade satisfactory for premium-priced drilling mud.

KYANITE. Cyanamid 800 Series Reagents have proved practical in concentrating a feed containing 30% $Al_2O_3SiO_2$ and 1½% Fe_2O_3. End-product averages 58% alumina with grade suitable for ceramic use. All evidence indicates that flotation of many lower-grade kyanite ores is perfectly practical.

RHODOCROSITE. A well-known copper property contains zones in which the ore is high in manganese and sulphide minerals. This ore is treated to recover the sulphides and the tailing is conditioned with 0.90 lb./ton Cyanamid Reagent #825 plus 0.80 lb./ton cotton-seed oil foots in an alkaline circuit to produce a 35% manganese concentrate from 14% feed. Previous practise used acidulated cotton-seed oil foots. The change to Cyanamid Reagent #825 in a alkaline circuit gave greater selectivity and lower reagent cost.

It will pay you to get in touch with Cyanamid if you mine or contemplate mining any of these minerals:

ANDALUSITE BARITE BAUXITE CEMENT ROCK COAL CHROMITE DIAMONDIFEROUS GROUND DOLOMITE FELDSPAR FLUORSPAR GARNET GLASS SANDS GRAPHITE GRAVEL GYPSUM ILMENITE IRON OXIDES KYANITE MAGNESITE MANGANESE MICA OLIVINE PEARLITE PHOSPHATE ROCK POTASH RHODOCHROSITE SALT SILLIMANITE SCHEELITE SPODUMENE VERMICULITE WOLFRAMITE AND SIMILAR MINERALS

Quickly, at low capital cost, you may be able to increase output, cut costs by less selective mining, work currently sub-marginal deposits or ship higher grade end-products. We offer you the benefit of our extensive experience in concentrating non-metallic and metallic oxide minerals. Preliminary discussion entails no cost or obligation. Why not write us, outlining your problem?

AMERICAN *Cyanamid* COMPANY

MINERAL DRESSING DIVISION

30 ROCKEFELLER PLAZA NEW YORK 20, NEW YORK

HIGHLY RECOMMENDED

for low cost service

CRANE

IRON BODY—WEDGE DISC

Clamp Gate Valves

Crane Wedge Disc Clamp Gate Valves come in OS&Y, inside screw, and quick-opening patterns, all-iron or brass trimmed, screwed or flanged end. Sizes up to 4 in. Working pressures up to 150 psi saturated steam, 225 psi cold service.

Low in first cost, as well as in upkeep... and look at their wide utility—

Use Crane Clamp Gate Valves for steam; hot and cold water; crude, fuel, and lubricating oil; air, gas, and gasoline service.

Also in food and chemical process industries for caustic solutions, alkalies, corrosive chemicals, and gases.

You'll find Crane Clamp Gate Valves extra rugged, with a strong reinforced body and husky stem. Their compact design means a better fit for more places... a saving on piping in many cases. And because of the simplified clamp construction, these valves enjoy wide favor where frequent cleanout is essential. The bonnet assembly and wedge disc lift out easily—the body stays in the line. Reassembling is no problem for the bonnet joint always makes up tight and stays tight.

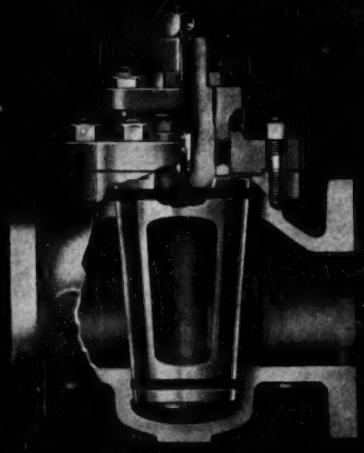
Wide choice of regular patterns, all-iron or brass trimmed. On inside screw all-iron valves, an improved self-draining bonnet prevents entrapment of line fluids in the bonnet—protects the threads, keeps the stem working smoothly. Send for Folder AD 1667 or ask your Crane Representative for full details.

The Complete Crane Line Meets All Your Valve Needs. That's Why
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



LUBRICATED PLUG

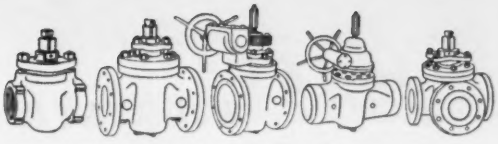
COMPLETE LINES OF LUBRICATED PLUG VALVES

Because of the wide range of services to which Lubricated Plug Valves can be adapted, they may be classed as "all-purpose" valves. Walworth manufactures complete lines of Lubricated Plug Valves in a variety of types and materials for working pressures up to 5,000 psi and for vacuum services. Sizes range from ½ to 30 inches. Write for descriptive literature.

Walworth also manufactures complete lines of gate, globe, angle, and check valves made of steel, bronze, iron, and special alloys.

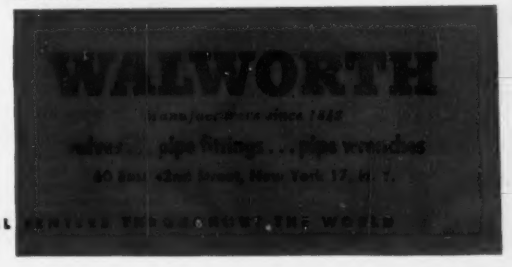
Walworth valves, pipe fittings, and pipe wrenches total approximately 50,000 items and are sold through distributors all over the world.

Walworth engineers will be glad to help you with your problems. Call your local Walworth distributor, nearest Walworth sales office, or write to our General Offices, 60 East 42nd Street, New York 17, New York.

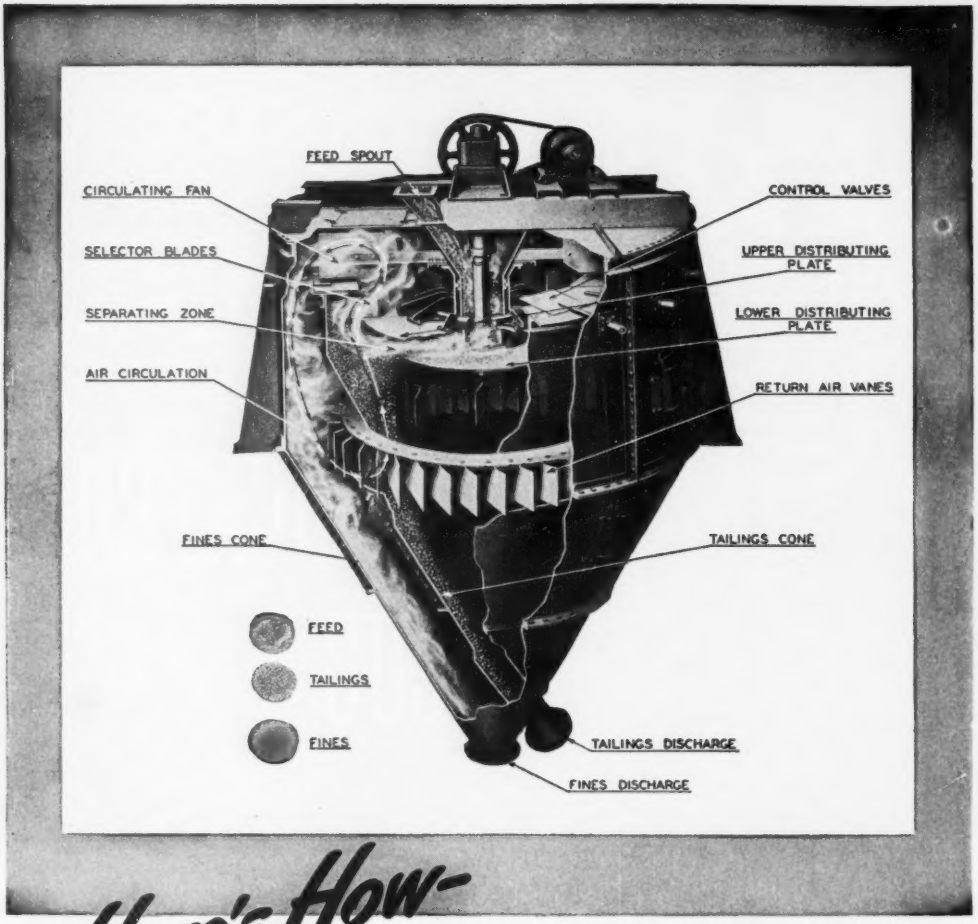


Illustrated in section is a Walworth No. 1700F Regular Gland Type, Wrench Operated, Steeliron, Lubricated Plug Valve. This particular line of valves has a working pressure rating of 200 psi at 150F or 125 psi at 450F. Sizes range from ½ to 8 inches. Other Walworth Lubricated Plug Valves include Single Gland and Ball Bearing types. They are available for a variety of working pressures.

For best results use Walworth Lubricants and Walworth High Pressure Lubricant Guns.



DISTRIBUTORS IN PRINCIPAL



Here's How—

STURTEVANT AIR SEPARATORS

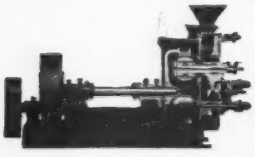
Produce accurate fines with increased output up to 300%

Exact regulation and control of centrifugal forces and air currents, one counteracting and overbalancing the other so precisely that by simple adjustments a product of almost any desired fineness is selected and collected, while coarser sizes are rejected . . . that's the principle of operation of Sturtevant Air Separators.

The benefits you derive from this separator are—increased output by as much as 25% to 300% . . . lower power costs by 10% to 50% . . . reduced maintenance.

A typical on-the-job example is as follows—a 16 ft. separator takes a feed of 750 tons per hour containing only a small percentage of the desired product and delivers 30 tons of material 90%, minus 200 mesh.

Investigate Sturtevant Air Separators today. Write for information and bulletin.



RING ROLL MILL

Capacities from 12 to 18 tons per hour. Range 10 to 200 mesh. Use this mill in closed circuit with Sturtevant Air Separators.

STURTEVANT
MILL COMPANY
101-A Clayton Street, Boston 22, Massachusetts
Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

Refining of copper and precious metals takes advantage of STAINLESS STEEL'S corrosion resistance

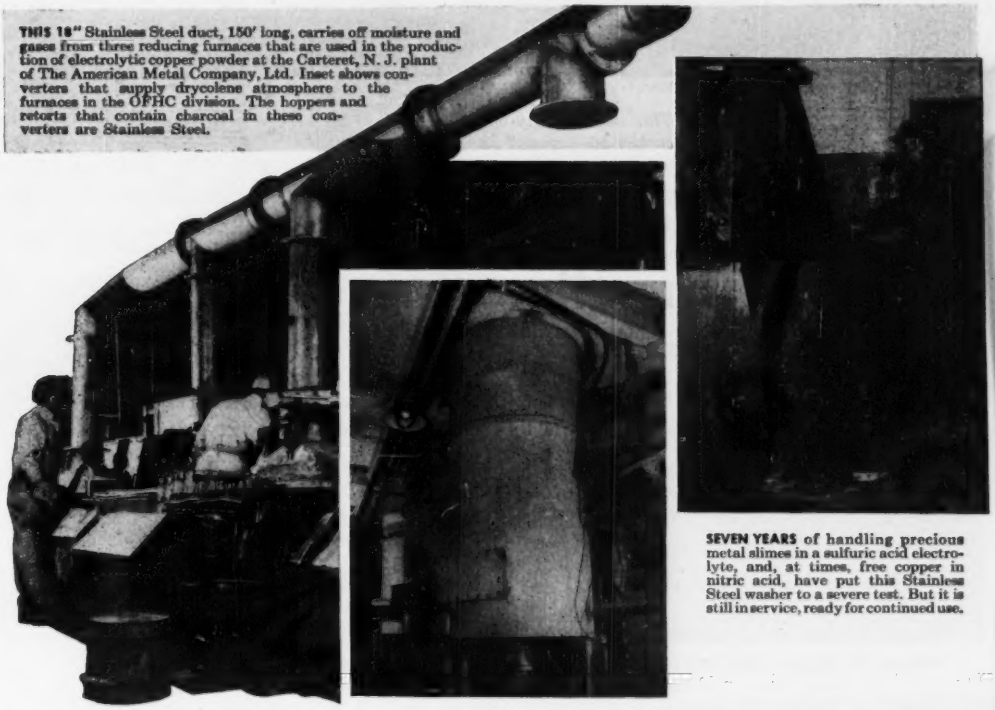
THE Carteret, N. J. plant of The American Metal Company, Ltd.—one of the largest custom smelting and refining operations in the country—puts corrosion-resisting, long-lasting Stainless Steel to good use in several key spots in its processing cycle.

Slimes containing precious metals from the electrolytic copper refining tanks are washed in a Stainless Steel washer. The "mud" is received from the plating tanks in sulfuric acid electrolyte, 200 grams per liter in strength, and is washed out with hot water at 180°F. At times, a surplus of free copper in nitric acid is directed to the washer. In spite of such severe service, the Stainless washer has been in operation seven years.

Stainless Steel lorries are replacing mastic-lined carts in the silver department. Crystals in 2% nitric acid are put into the carts from Balbach-Thum cells. The Stainless carts have been in service three years without sign of wear while the mastic-lined carts required repairs at four-month intervals.

Stainless Steel hoppers and retorts hold the charcoal that furnishes the drycolene atmosphere for use in the furnaces that produce OFHC copper. Charcoal in the three drycolene converters is held at 1900°F. continuously. The reducing furnaces in the copper powder division are equipped with a Stainless Steel duct to carry off atmospheres consisting of 12% hydrogen, 10% carbon monoxide, 12% carbon dioxide and 66% nitrogen and sulfuric acid.

Stainless Steel's exceptional corrosion resistance, its dense, smooth surface, its long, trouble-free service life, fit it for a wide variety of jobs in the metal mining and refining industries. Take advantage of its benefits, and when you do, insist that your equipment manufacturer use perfected, service-tested U·S·S Stainless Steel.



THIS 18" Stainless Steel duct, 150' long, carries off moisture and gases from three reducing furnaces that are used in the production of electrolytic copper powder at the Carteret, N. J. plant of The American Metal Company, Ltd. Inset shows converters that supply drycolene atmosphere to the furnaces in the OFHC division. The hoppers and retorts that contain charcoal in these converters are Stainless Steel.

SEVEN YEARS of handling precious metal slimes in a sulfuric acid electrolyte, and, at times, free copper in nitric acid, have put this Stainless Steel washer to a severe test. But it is still in service, ready for continued use.

UNITED STATES STEEL COMPANY, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

2-1989

UNITED STATES STEEL

GIDDYUP! WHOA! BACK UP!
This was one way of bringing ore to the surface back around 1890. Three men and two horses—and a mighty small bucket!

An enlargement of this photo suitable for framing is yours for the asking.

Times Have Changed...

Horse-drawn blasting practices are out-of-date, too!

Fantastic, isn't it, that primitive methods of mining such as the horse-drawn hoist could ever have shown a profit.

But it's equally fantastic that some mine operators who wouldn't think of having anything but the latest mechanical equipment forget that blasting practices also must be kept up to date.

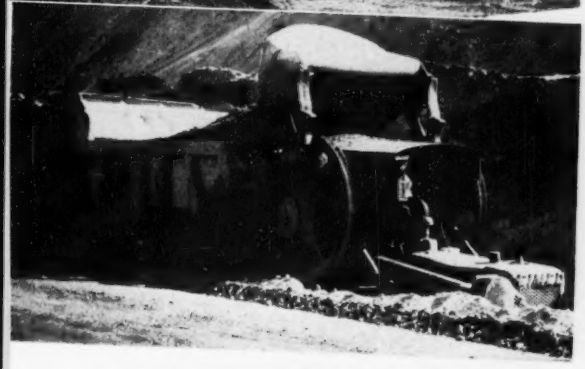
The milli-second delay blasting technique developed by Atlas in the ROCKMASTER Blasting System has practically revolutionized theories of explosives action. ROCKMASTER makes the most of explosives energy . . . gives control over breakage, throw, noise and vibration never before possible. And sizeable reductions in explosives load and number of holes per round!

Send for the free 20-page ROCKMASTER book today to see how times have changed and have made possible really better blasting.

ATLAS EXPLOSIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*



HIGHWAY DEPARTMENT'S MOST USEFUL LOADER

Your Eimco can dig ditches, clean up slides, dig up shoulders, speed up new construction, in tunnels, loading trucks or in quarries loading rock.

The Eimco will load rock at the rate of 4 to 6 tons per minute average and sand or gravel at 6 to 8 yards per minute average.

The speed, efficiency and low cost of Eimcos make them preferred equipment in any highway department. Let us tell you of the many other advantages in using Eimcos.

A4/2

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

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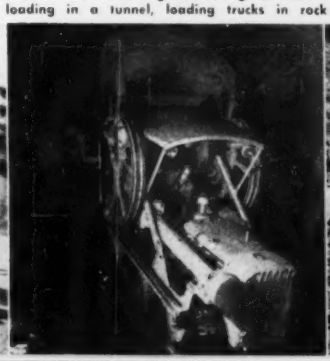
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY: EIMCO ITALIA, S.P.A., MILAN, ITALY

You Can't Beat an Eimco

Above: Digging ditch beside highway in Canada. Below, left to right: Clearing rock off highways, taking out shoulder for highway widening, loading in a tunnel, loading trucks in rock quarry.



THE IMPROVED

Exide-Ironclad

BATTERY

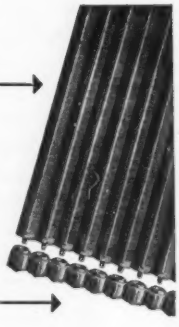
GIVES you more . . . SAVES you more

It gives you more of everything that adds up to top performance, long battery life . . . saves you more through low over-all costs. Outstanding new features, including the polyethylene insulating tube sealer, *more than ever before*, make Exide-Ironclad YOUR BEST POWER BUY . . . AT ANY PRICE.

HERE'S WHAT YOU GET

Rapid, high production haulage, more trips per shift . . . High maintained voltage, with uniform speed to end of shift . . . High availability . . . Low operating costs . . . Low maintenance costs . . . Low depreciation costs . . . Safety from hazards of fire and fumes.

AND HERE'S WHY



IMPROVED POSITIVE PLATE CONSTRUCTION. The long-life grids now contain SILVIUM—an alloy of silver, lead and other components—which makes them highly corrosion-resistant.

NEW POLYETHYLENE INSULATING TUBE SEALER of acid-proof, non-corroding plastic. It fits snugly into slotted tubes of positive plates, and reduces loss of active material. Even the small sediment deposit of the past is reduced 50%. Thus more active material remains available, and the high battery capacity is maintained for a longer working life.

PLUS THESE EXTRAS

IMPROVED NEGATIVE PLATES for higher electrical efficiency.

NEW SEALING COMPOUND provides permanent seal between jar and cover.

SEAMLESS SHOCK-PROOF JAR, of high-quality rubber. A scientifically selected combination of tensile strength and elongation provides a sturdy jar built for long-life and heavy-duty service.

NEW UNBREAKABLE PLASTIC VENT PLUGS of polyethylene.

TYPES, SIZES AND CAPACITIES for battery-electric mine haulage units of every make.

THE ELECTRIC STORAGE BATTERY COMPANY
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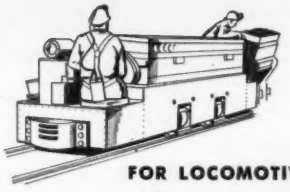
Exide Batteries of Canada, Limited, Toronto

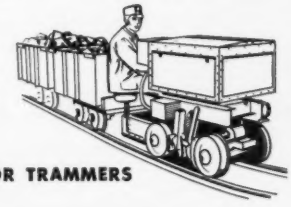
1888

DEPENDABLE BATTERIES FOR 64 YEARS

1952



FOR LOCOMOTIVES



FOR TRAMMERS

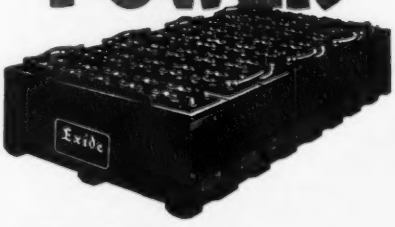
FOR SHUTTLE CARS

Exide-Ironclad

IS YOUR BEST POWER BUY

. . . AT ANY PRICE

POWER



"EXIDE-IRONCLAD" and "SILVIUM" *Reg. T.M. U.S. Pat. Off.*

Change to the best bit type for the job *right on the job!*

Both TIMKEN® rock bit types fit the same drill steel!

YOU can change to the most economical bit for the job as the ground changes—right on the job—if you're using Timken® interchangeable rock bits. Both Timken carbide insert and multi-use bits fit the same drill steel.

When drilling in ordinary ground use Timken multi-use bits. With correct and controlled reconditioning, they give you the lowest cost per foot of hole when full increments of steel can be drilled.

When you hit hard, abrasive ground, quickly change to Timken carbide insert bits for greatest economy. They're your best bet for maximum speed, constant-gage holes, small diameter blast holes and very deep holes.

By using Timken carbide insert and multi-use bits, you put the right answer to every drilling problem right at your drillers' finger tips. Both bit types are interchangeable in the same thread series. And both types give you these three big advantages: 1) made from electric furnace Timken fine alloy steel, 2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, 3) quickly and easily removable.

Call upon the 20 years' experience of our Rock Bit Engineering Service for help in selecting the best bits for your job. Write The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

Timken threaded multi-use rock bit

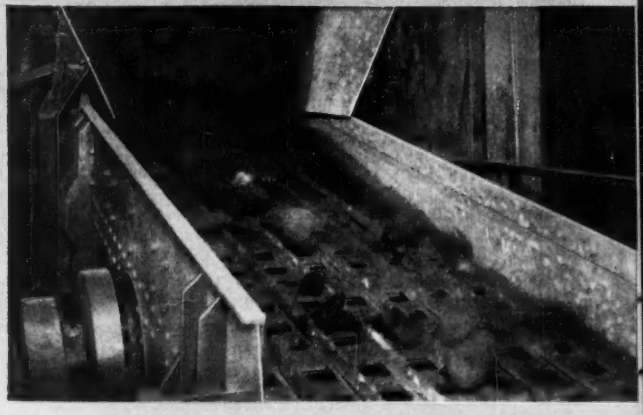
Timken threaded carbide insert rock bit

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit . . . for every job

WORLD'S LARGEST CRUSHER is this 3500-tph, 60-109 *Superior* gyratory being built for Mesabi's first commercial taconite plant. Ultimate plant output will be 10 million tons.



FINES ARE SCALPED from r.o.m. ore on sturdy 1000-tph vibrating screens like this one in Minnesota. A-C builds *six* separate types of vibrating screens for beneficiation.

EQUIPMENT FOR IRON ORE BENEFICIATION: Gyratory and jaw crushers . . . Vibrating screens . . . All types of washers . . . Concentrating jigs . . . Rod, ball, and *Ballpeb* mills . . . Centrifugal pumps . . . Rotary kilns and coolers . . . *Texrope* V-belt drives . . . All types and sizes of electric motors and generators . . . Starters . . . Transformers and voltage regulators . . . Complete power generation, distribution, control equipment.

the Bottom!

As Mesabi Ores Lean Out, Allis-Chalmers Aids in Beneficiation

DIRECT SHIPPING ORES are fading fast up on the once fabulous Mesabi range. But despite foreign ore discoveries, by 1955 a quarter of blast furnace feed must be beneficiated domestic ore.

Allis-Chalmers — manufacturer of equipment for the steel industry from the mine to the mill — is helping lead the way to more economical beneficiation of lean ores.

Does low ore content require you to triple material handled? Allis-Chalmers will build you bigger, more efficient equipment! At far left below is the world's largest crusher, being built by A-C for a Mesabi taconite plant.

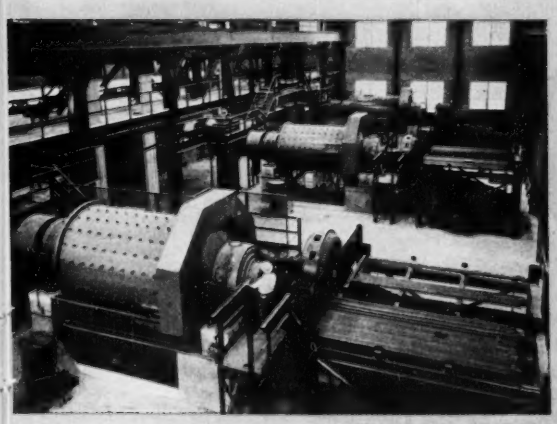
Has proper yet economical pelletizing got you stumped? Allis-Chalmers has just put into operation a pilot Pelletizing and Heat Hardening plant built exclusively for researching new pelletizing methods.

Do you have a beneficiation "shortcut" in mind? Don't let lack of equipment postpone your testing of new processes. The Allis-Chalmers Processing Research Laboratory stands ready to accurately and exhaustively test any processing method on a confidential basis.

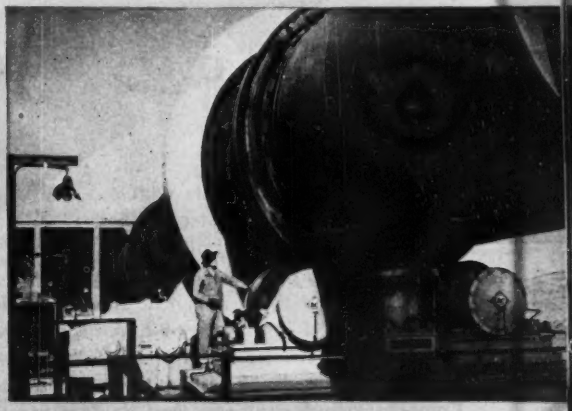
For over half a century Allis-Chalmers equipment has been processing ores for America's steel industry. Some of the cost-cutting, tonnage-increasing ore beneficiation equipment in the broad A-C line is seen on these pages.

Allis-Chalmers offers you *one-manufacturer responsibility* for process, drive and control equipment all along your flow sheet. For literature or detailed information on products and services, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3808

Superior, Ballpeb and Texrope are Allis-Chalmers trademarks.



ORE IS GROUND in three rod and ball mills ahead of magnetic separation at this beneficiation plant. A-C builds *all* types of grinding mills for ore beneficiation processes.



IRON ORE IS AGGLOMERATED to make good blast furnace and open hearth feed in Allis-Chalmers rotary kilns in connection with iron mines and beneficiation plants.

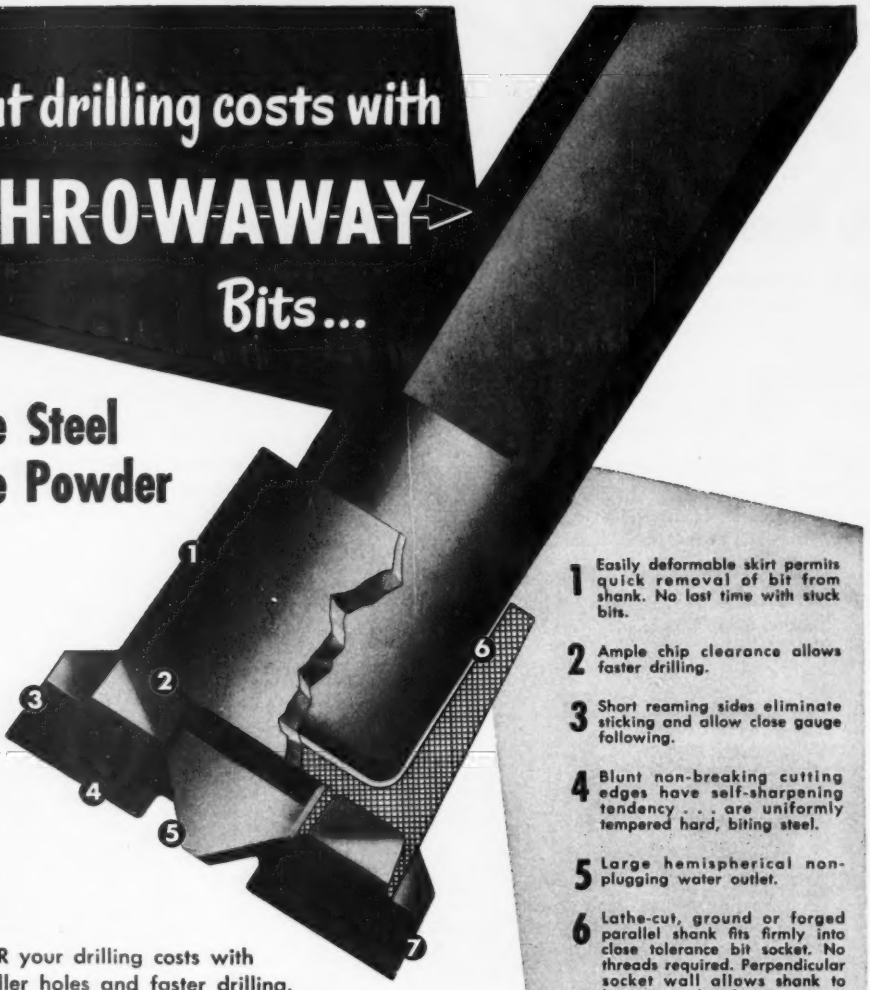
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Power, Electrical, Processing Equipment for Iron and Steel

Cut drilling costs with THROWAWAY Bits...

Save Steel
Save Powder



1 Easily deformable skirt permits quick removal of bit from shank. No lost time with stuck bits.

2 Ample chip clearance allows faster drilling.

3 Short reaming sides eliminate sticking and allow close gauge following.

4 Blunt non-breaking cutting edges have self-sharpening tendency . . . are uniformly tempered hard, biting steel.

5 Large hemispherical non-plugging water outlet.

6 Lathe-cut, ground or forged parallel shank fits firmly into close tolerance bit socket. No threads required. Perpendicular socket wall allows shank to bottom in bit for maximum performance.

7 Perfect uniformly treated bit teeth assure best possible cutting power and smooth operation.

LOWER your drilling costs with smaller holes and faster drilling. Bottom with 1¼ inch holes and save costly steel and powder. Let us prove to you that the man at the drill can do more work for less cost with a Throwaway Bit. Write for new low price list and technical description of Throwaway Bit to: Portland, Oregon home office or distributors listed below. Competent field engineers and dealers are always at your service.

THROWAWAY BIT CORPORATION

4200 N. W. YEON AVENUE., PORTLAND, OREGON

BONNE TERRE FARMING & CATTLE CO
Bonne Terre, Missouri

CREATING ENGINEERING
825 1st National Bank Building
Denver, Colorado

GREENAWALT-WHEELOCK & CO.
415 Mills Building
El Paso, Texas

Whether you want one worm-gear speed reducer or a thousand, a standard drive or a unit designed to meet special problems, Cleveland can serve you better.

"Cleveland" is the standard in worm gearing

●When you specify "Clevelands—or equal," you can be confident that you are getting the finest in worm-gearing.

The uniform dependability that has distinguished Clevelands through 40 years has established "Cleveland quality" as the measure of value in worms and gears. Cleveland sets the pattern through four outstanding features:

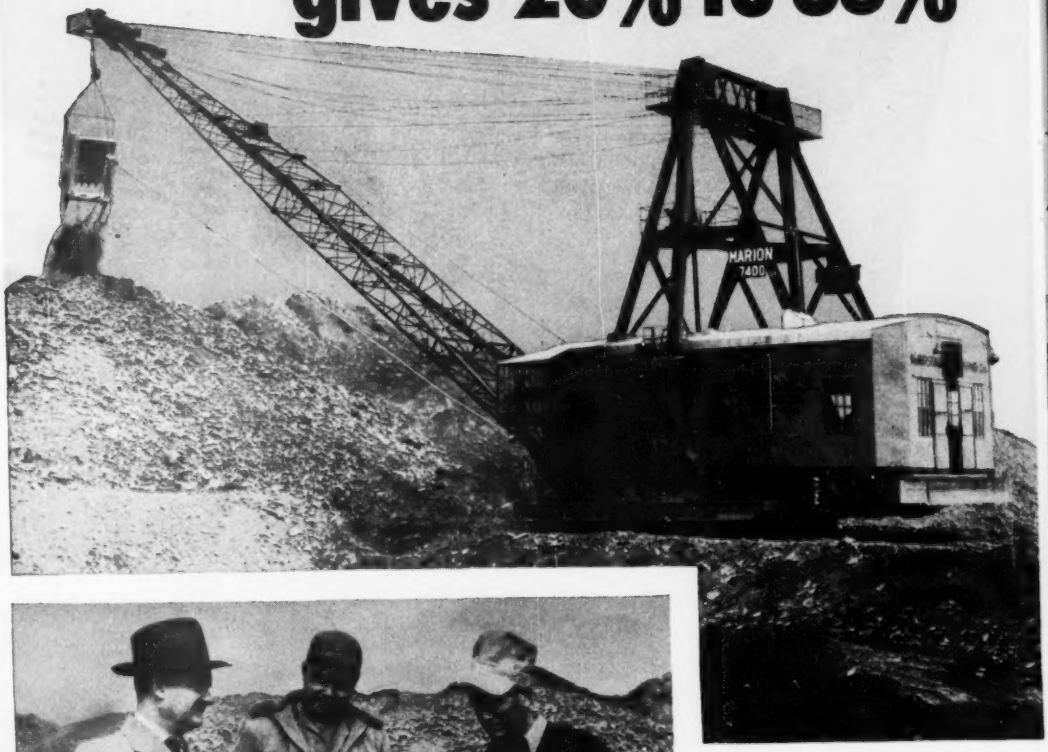
1. *Correctness of design*—proved by years of performance.
2. *Finest of materials*—selected on the basis of long experience and research.
3. *Modern manufacturing facilities*—kept up-to-date by a policy of continuous replacement.
4. *Precision workmanship*—by machinists and other production workers, trained as craftsmen.

Cleveland offers a complete line of worm gear sets and speed reducers, including the popular fan-cooled Speedaire—to meet the needs of any machinery or equipment builder or user. Representatives in all major industrial centers are at your service. Write for our current catalog.

The Cleveland Worm & Gear Company, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

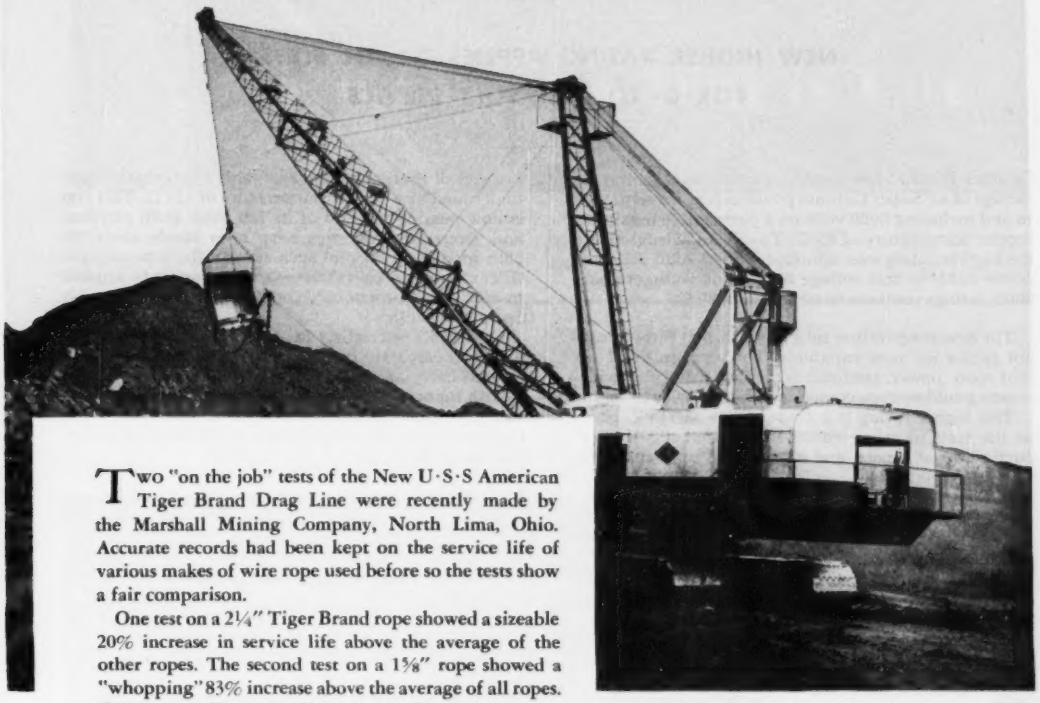
New American Tiger gives 20% to 83%



20% INCREASE IN WIRE ROPE LIFE. When this 14 cu. yd. drag line was equipped with the new Tiger Brand 2¼" Drag Line, the average service life of the rope was increased 20% over other brands tested.

SAVES MONEY AND TIME—INCREASES PRODUCTION. This new Tiger Brand Drag Line Rope quickly pays for itself through increased life and greater production. Try it next time you have to replace your drag rope.

Brand Drag Line increase in service life



Two "on the job" tests of the New U·S·S American Tiger Brand Drag Line were recently made by the Marshall Mining Company, North Lima, Ohio. Accurate records had been kept on the service life of various makes of wire rope used before so the tests show a fair comparison.

One test on a 2¼" Tiger Brand rope showed a sizeable 20% increase in service life above the average of the other ropes. The second test on a 1⅝" rope showed a "whopping" 83% increase above the average of all ropes. Digging conditions in all cases were the same.

This new Tiger Brand Drag Line was designed especially to resist the severe operating conditions imposed by this class of service.

The use of this new rope on your drag line will mean substantial savings in your wire rope costs. It will cut your down time and help to keep machines at top capacity.

DRAG LINE LIFE INCREASED FROM 600 HOURS TO 1100 HOURS —83%. The best service on this drag line using 1⅝" rope averaged 600 hours for other brands of rope. But with the new U·S·S Tiger Brand Rope, service life jumped to 1100 hours—almost double the previous average.

U·S·S AMERICAN TIGER BRAND WIRE ROPE

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Excellay Preformed

UNITED STATES STEEL

NOW... G-E Super Coronol* rated at 85 C copper temperature

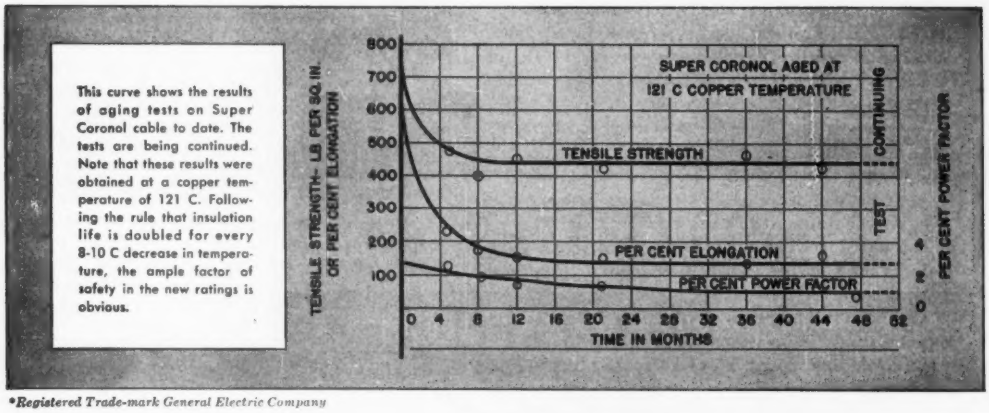
NEW HIGHER RATING APPLIES TO ALL SIZES FOR 0- TO 8000-VOLT SERVICE

General Electric has announced that it is basing the ratings of all Super Coronol power cables for service up to and including 8000 volts on a permissible maximum copper temperature of 85 C. To our knowledge this is the highest rating ever announced for a solid dielectric power cable in this voltage range. For voltages above 8000, ratings continue to be based on 80 C.

The new temperature ratings mean that Super Coronol cables are now capable of carrying up to 12 per cent more power, continuously, than old-style ozone-resisting rubber-type compounds rated 75 C maximum.

This higher rating is a conservative increase, based on life tests of many cables taken from regular production. Most severe, and at the same time, most impressive of these tests involves cable held continuously under load at a copper temperature of 121 C. This test is now nearing the end of its 5th year. Both physical and electrical properties have been stable since the 20th month. In view of such results, the new rating is still extremely conservative—*and can safely be applied to all Super Coronol cable now in service at potentials up to 8000 volts.*

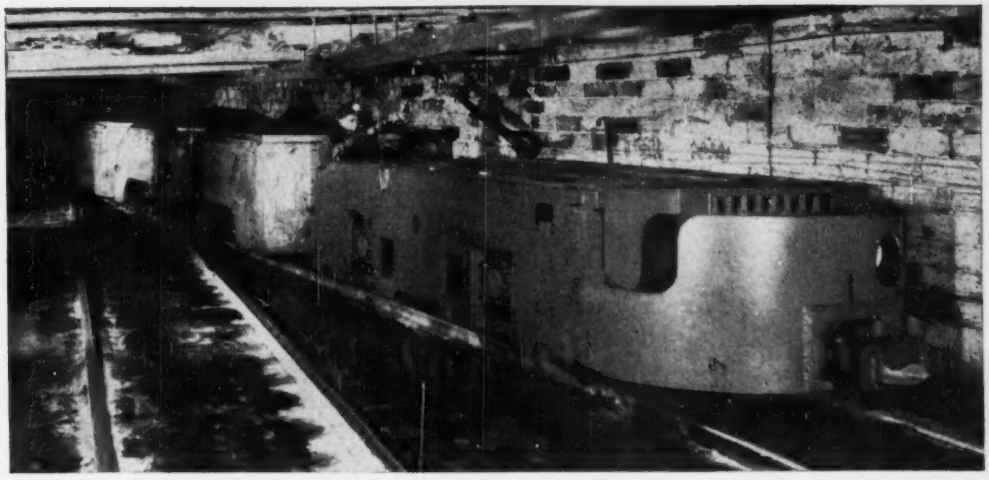
G-E cable specialists in your area will be glad to help you calculate just what this new rating means in current-carrying capacity in any specific installation—both for continuous loading and for emergency overloads. Or you may wish to write Section W45-1095, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.


This curve shows the results of aging tests on Super Coronol cable to date. The tests are being continued. Note that these results were obtained at a copper temperature of 121 C. Following the rule that insulation life is doubled for every 8-10 C decrease in temperature, the ample factor of safety in the new ratings is obvious.
TENSILE STRENGTH- LB PER SQ. IN. OR PER CENT ELONGATION
800
700
600
500
400
300
200
100
SUPER CORONOL AGED AT 121 C COPPER TEMPERATURE
TENSILE STRENGTH
PER CENT ELONGATION
PER CENT POWER FACTOR
TEST CONTINUING
4
2
0
PER CENT POWER FACTOR
0 4 8 12 16 20 24 28 32 36 40 44 48 52
TIME IN MONTHS

*Registered Trade-mark General Electric Company

Single conductor-Geoprene jacket | Single conductor shielded Geoprene | Pre-assembled aerial cable | Mine Power Cable | Two-conductor concentric lighting cable

GENERAL ELECTRIC



O-B COUPLERS SUIT ALL MINE HAULAGE NEEDS!

The cars, locomotive, trolley system *and* the O-B Couplers used in this underground railroad are designed specifically for mine service. Curve radii, dips, speeds and dumping methods determine the coupler design that will best serve a busy haulage system, just as headroom and dumping methods influence car design. That's why O-B Automatic Mine Car Couplers, designed for heavy, high-speed mine car haulage are your best choice for safe, swift coal movement.

You'll do well to consider O-B Automatic Couplers when you remodel or replace your present cars. Ask your O-B representative for more information on these MINE couplers!

Because they are made especially for mine cars, O-B Couplers meet underground haulage requirements with these five features:

1. **Extra-wide gathering range. Cars couple automatically on minimum-radius curves.**
2. **Positive interlock. Cars join securely on impact without attention.**
3. **Automatic self-centering. No need to align mating heads manually before coupling.**
4. **Tough, durable draft gear. Rubber-cushioned O-B Couplers absorb blows as high as 100,000 pounds.**
5. **Increased track stability. O-B Form-8 Couplers actually work against the cars' tendency to take a skewed position on the track.**

Ohio Brass

MANSFIELD OHIO, U. S. A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4292-M

Test Pilot

"Just try those springs," the salesman says and his customer, canny as well as pretty, takes him at his word. She wants to be sure what she's getting.

Testing is a good way to double-check Multiwall bags too. Subject them to the toughest going you can. Make sure your manufacturer checks them also—continuously and against rigid performance standards.

In Union's testing laboratories, Multiwalls have to prove themselves constantly—for strength, durability, moisture resistance, sift-proofness, every characteristic you expect of a good package.

Union Multiwalls are *uniformly* high standard. They are manufactured in the world's largest integrated pulp-to-container plant. Only in an integrated plant can first-hand control be maintained over *every step* of the process by which your package is made.

Best proof of the value of this extra protection is in the buying habits of America's largest Multiwall users. Men who purchase more than 85 per cent of the total production of Multiwalls list* dependable quality as one of their most important considerations in choosing a Multiwall supplier.

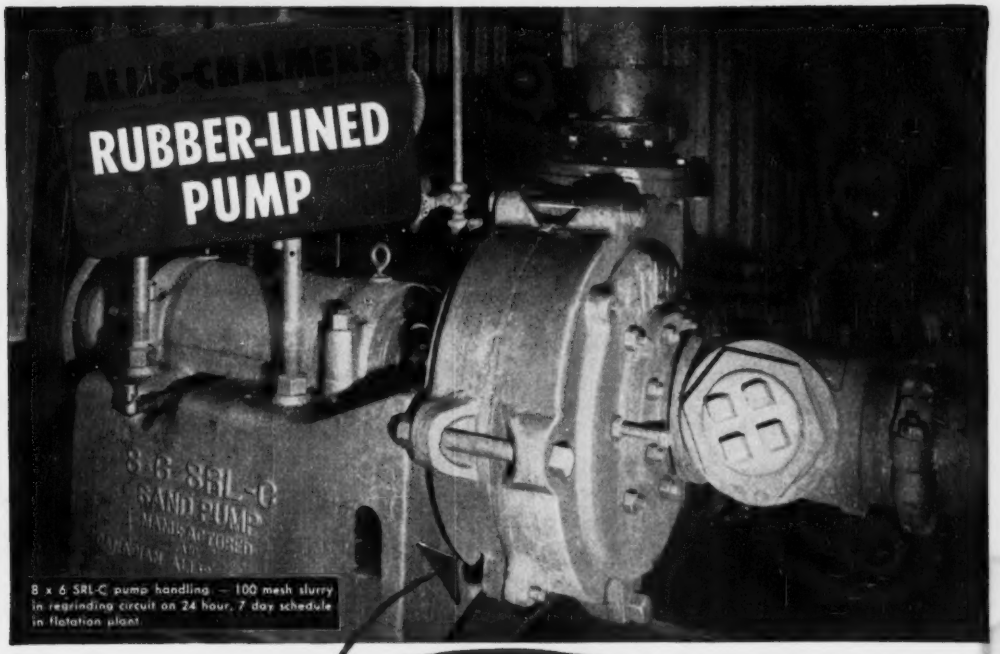
Insistence on uniformly high manufacturing standards is one of the many good reasons why, to a greater extent each year, these major buyers turn to Union for a substantial share of their increased Multiwall requirements.

More so every day . . .

IT'S UNION FOR MULTIWALLS

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING


RUBBER-LINED
PUMP
8 x 6 SRL-C pump handling — 100 mesh slurry in regrinding circuit on 24 hour, 7 day schedule in flotation plant.

Here's How THIS PUMP Cuts Slurry and Slime Pumping Costs

SPECIAL RUBBER COMPOUNDS, engineered to fit each application, resist wear of even the most abrasive slurries and slimes. Original capacity and efficiency are maintained over long periods. Records show that the Allis-Chalmers rubber-lined pump has a service life 10 to 50 times greater than the finest alloy pumps when handling finely divided, highly abrasive materials. This means that the higher price of the rubber-lined pump is saved many times over in lower maintenance cost and less lost production due to shutdowns. The stuffing box, too, is specially designed to reduce packing wear.

EASY MAINTENANCE

Maintenance on the Allis-Chalmers rubber-lined pump is easy. All parts normally requiring attention are accessible for inspection, adjustment or replacement. The casing can be parted easily when impeller and liners must be checked. The stuffing box is easy to work on.

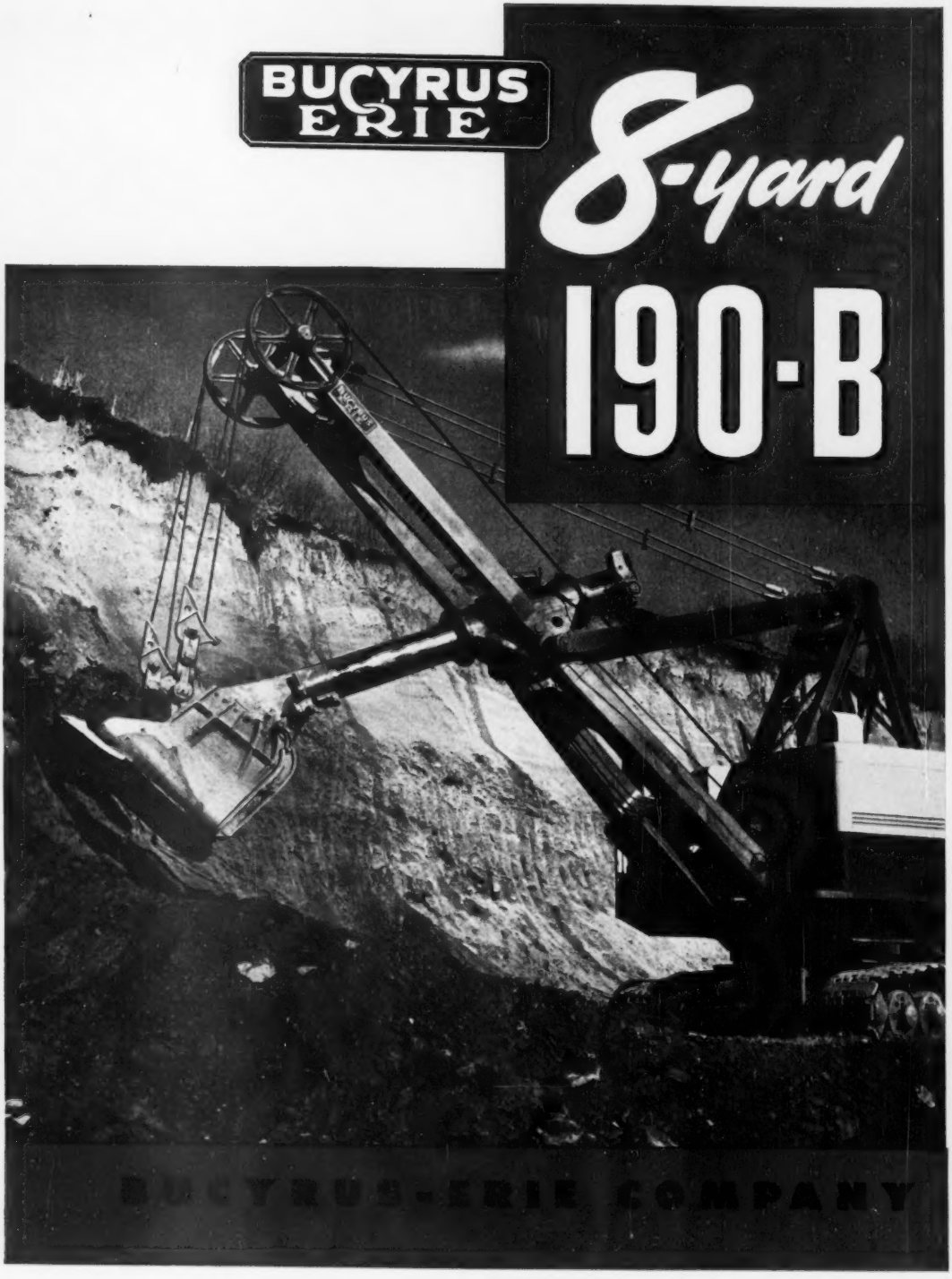
The casing liners are of unique construction. The rubber compound is pressure-molded to steel frames. The liners fit into casing easily and are held securely in place by studs which are part of the steel frame and are securely embedded in the rubber. Liners and the impeller can be renewed without removing the pump from its location and spares can be kept on hand.

COMPETENT APPLICATION ENGINEERING

Allis-Chalmers application engineers are thoroughly familiar with all types of solids pumping problems. Allis-Chalmers can furnish you a complete pumping unit — pump, motor, control and drive — all of coordinated design and manufacture. For help on your solids pumping problems, call your nearest Allis-Chalmers District Office. For more information on the A-C Rubber-Lined Pump, write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 08B7311.

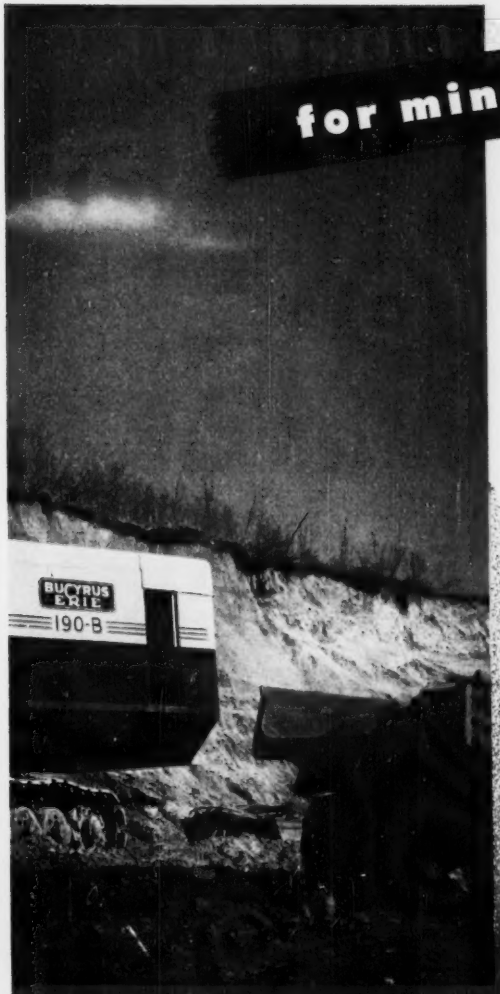
A-3897

ALLIS-CHALMERS


BUCYRUS ERIE
8-yard
190-B
BUCYRUS-ERIE COMPANY

ANOTHER SMOOTH, FAST, BIG OUTPUT SHOVEL

for mines and quarries



The new 190-B follows the tradition of Bucyrus-Erie leadership in producing high quality excavators capable of delivering consistently big output at lowest possible cost per cubic yard. This 8-cubic yard shovel and dragline offers you many outstanding features — features that add up to greater capacity, higher output, and faster, smoother, more economical operation. Among these outstanding features are:

EXCLUSIVE TWO-SECTION BOOM

reduces shovel front-end weight, increases swing speed and payload capacity, yet provides ample strength for tough digging.

POWERFUL, MAIN MACHINERY

designed for double twin hoist, delivers power surely, smoothly, efficiently.

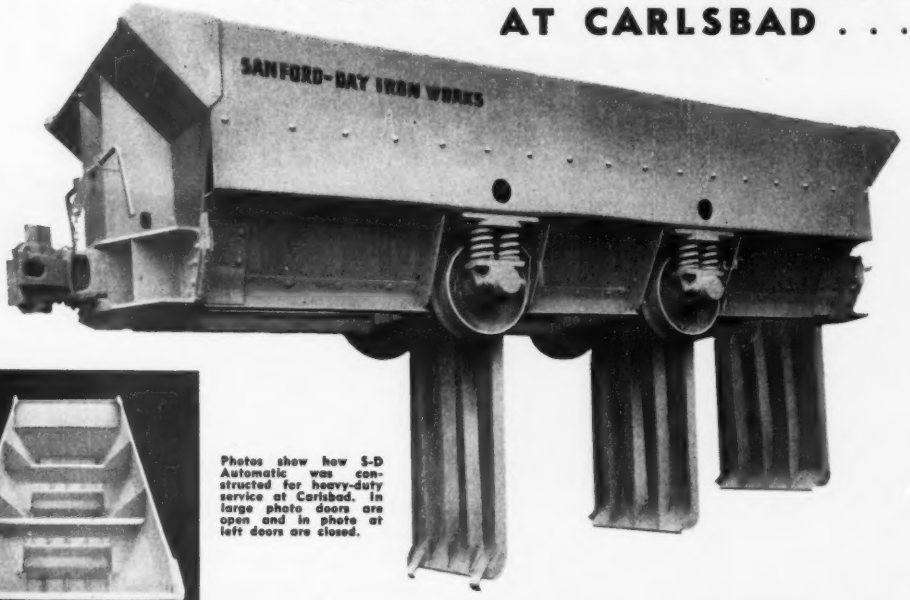
LARGER, STRONGER MOUNTING

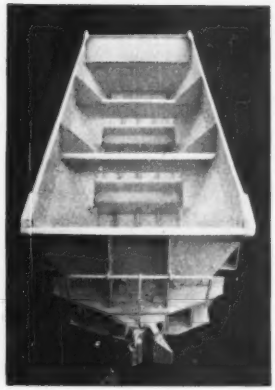
provides ample strength for heavy duty and protective features for minimizing wear.

The 190-B has full Ward Leonard improved rotating control, is readily convertible to dragline service, and has numerous other outstanding features to meet the precise needs of your toughest jobs.

SOUTH MILWAUKEE, WISCONSIN

UNITED STATES POTASH CO. CONTINUES MODERNIZATION PROGRAM AT CARLSBAD . . .





Photos show how S-D Automatic was constructed for heavy-duty service at Carlsbad. In large photo doors are open and in photo at left doors are closed.

INSTALLS S-D AUTOMATIC DROP BOTTOM MINE CARS

The most recent development in the U. S. Potash modernization program at Carlsbad, New Mexico is the installation of 25 S-D Automatic Cars.

The S-D Automatic Drop Bottom Cars will haul potash non-stop because trips dump-on-the-move. A tripping device mounted between rails automatically opens the doors as each car moves over opening between rails at the Surge Bin. After dumping load and as each car moves out of the bin, a closing device automatically locks doors shut. Expensive dumping equipment and dumping labor are both eliminated.

The capacity of each car is between 8 to 10 tons. Each is approximately 16½ feet long by 5½ feet wide by 48 inches high. All cars are sealed against dust leakage and operate on a 42 inch track gauge. These cars are built of ½ inch steel for heavy-duty performance.

But this page isn't big enough for the whole story. We point out this Carlsbad installation as evidence that heavy-duty S-D Automatics offer the most practical and most economical method of haulage for many metal and non-metallic mines. At the same time, you will not want to overlook the fact that in your particular operation our S-D Rocker-Type Side Dump Cars or our S-D Rotary Cars may be the logical answer to lower costs. Certainly, our more than 50 years of experience in building mine cars exclusively for almost every conceivable operation places us in an excellent position to build the exact car needed for your operation.

Our engineers are available at any time to assist you in adapting the S-D Automatic Car to your operation. Sanford-Day Iron Works, Knoxville, Tenn.

After 50 years of leadership in the industry, Sanford-Day still devotes its entire capacity to the production of mine cars. Most of the improvements in mine car design and construction originate with this company.

SANFORD-DAY IRON WORKS

LOOK TO MANCHA

for Storage Battery Locomotives that exactly meet your mine conditions

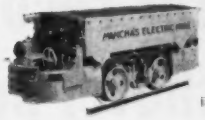
Heavy haulage service . . . gathering . . . light tramming—whatever your needs—there's a Mancha Storage Battery Locomotive designed to fit your particular requirements. Built in a wide range of sizes, horsepower, and battery capacities, Mancha locomotives operate efficiently, dependably, and safely. In mines all over the world, they're piling up production records that spell *extra profit every shift* for their owners.

3-MINUTE BATTERY CHANGE —NO MANUAL LABOR!

Mancha's famous transfer rack makes battery changing a one-man job—without manual labor.

569

HERCULES A
7½ TO 9½ TONS



1481

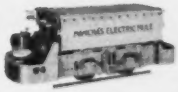
HERCULES
6 TO 7¼ TONS

1595

STANDARD AN
4¾ TO 6 TONS

917

STANDARD A
4 TO 5 TONS



1617

TITAN AN
3 TO 4 TONS

1578

TITAN BN
2 TO 2½ TONS

1714

LITTLE TRAMMER
1½ TONS

Will a MANCHA pay in your mine?

Send for our Mine Haulage Data-Form and get the answer. Mail the coupon *today*.

MANCHA STORAGE BATTERY LOCOMOTIVE
Division GOODMAN Manufacturing Company
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street,
Chicago 9, Ill., U.S.A.
E&MJ-1252
Send your Mine Haulage Data-Form

Name _____

Firm _____

Address _____

City _____ Zone _____ State _____

Here's electrical equipment for record-breaking shovel performance!

This Westinghouse-equipped Marion shovel set a new world's record by removing over 1.5 million cubic yards of overburden in just one month at an Eastern coal-stripping operation. In addition, another Westinghouse-equipped shovel at the same mine stripped over 1.3 million yards.

Over a million yards a month averaged during 1951

To attain this average, the shovel moved an average of over 2,000 yards per hour by moving 33.91 cubic yards per pass with an average time of 60.43 seconds per complete cycle. This fast operation is the result of the carefully co-ordinated design of Westinghouse generators, motors and Rototrol® control.

Smooth, controlled operation increases production

The Rototrol control is the "brain" of the shovel operation. When fast action is necessary, as during the swing, Rototrol "forces" the electric drive. The responsive action is quick, fluid and smooth. This prevents any shocks to the equipment and speeds up your operation. Rototrol also makes it impossible to overstrain the machinery. For example, during the crowd operation, the motors will stall out rather than force the bucket and cables.

Dependability of equipment reduces down time

The durability of the equipment is another reason for the record-breaking performance. The Rototrol, for example, is a simple, sturdy device that can be serviced right in the field. The M-G sets have special spherical-sleeve bearings which compensate for misalignment and permit operation even at tilts of 15°. The motors are designed and built to insure maximum durability.

Call Westinghouse on your next project

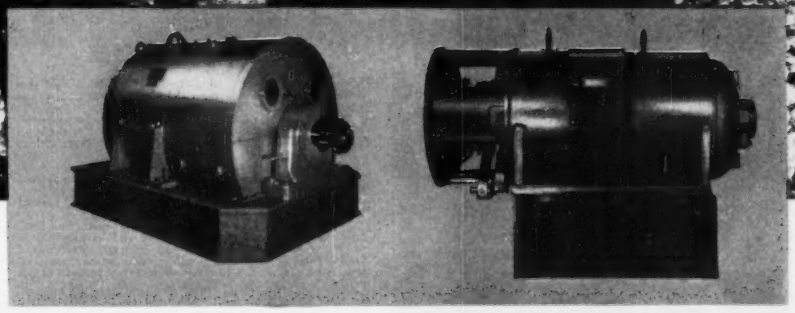
This is a good example of the performance Westinghouse builds into electrical equipment for mining. The next time you're planning a project, call in Westinghouse early. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94879

YOU CAN BE SURE ... IF IT'S

Westinghouse

EQUIPMENT FOR THE MINING INDUSTRY

They did what you can do to produce more



Westinghouse shovel motors are specially constructed to give you years of continuous operation even under the most rugged conditions. They are designed to help you get the most yardage out of your next shovel or dragline.

Rototrol is the master intelligence governing the shovel operation. It gives a quick, smooth responsive action to your operator's slightest control movement. This prevents shocks to equipment. The fast action cuts the digging cycle—speeds up production.

3 profit-making reasons

why your equipment should be built

By the use of U·S·S COR-TEN steel, this 26½ cubic yard dump trailer built by Trailmobile Co. was made stronger and more resistant to corrosion. But what's more, its weight was reduced by 1,000 pounds. That means it can haul 1,000 pounds more payload without any increase in loaded weight over a similar unit built of ordinary steel. And the extra cost for all of this? Only thirty dollars!

U·S·S COR-TEN STEEL

U·S·S COR-TEN is a ductile, low-carbon chromium-nickel-silicon-copper-phosphorus steel having a minimum yield point, in thickness of ½" and under, of 50,000 psi—at least one and one-half times that of structural carbon steel.

It has a minimum tensile strength of 70,000 psi in these same thicknesses. Its resistance to abrasion, shock and impact is superior to that of structural carbon steel; its fatigue resistance—that is, its ability to withstand vibration stresses, is 60% greater.

What particularly distinguishes U·S·S COR-TEN steel is its unusually high resistance to atmospheric corrosion—4 to 6 times that of plain steel, 2 to 3 times that of copper steel. It is this property that helps to assure the safety, long life and low maintenance cost of any equipment in which COR-TEN steel is used to obtain greater durability, or in lighter thicknesses to reduce weight.

U·S·S COR-TEN steel is produced in all standard products—plates, shapes, bars, sheets, strip, special cold formed sections, wire and tubular products. It is recommended particularly in light and intermediate thicknesses.

The bottom and sides of this drag conveyor and "take up", made by McNally-Pittsburg Manufacturing Corp., are of U·S·S A-R steel plates to resist wear and abrasion caused by thousands of tons of wet coal being moved from one deck to another in this coal processing plant. In applications such as this—and in picking tables, coal launders, loading hoppers, shakers, pick breakers and chutes—U·S·S A-R steel will give two to three times more wear than plain carbon steel.

U·S·S TRI-TEN* STEEL

This manganese-nickel-copper steel has a yield point of 50,000 psi min. and a tensile strength of 70,000 psi min. in thicknesses ½" and under, with moderately lower values as thickness increases to a maximum of 4". It has superior toughness and ability to withstand shock at sub-zero temperatures. It has greater resistance to abrasion than structural carbon steel (ASTM A7) and its fatigue resistance is 50% higher. U·S·S TRI-TEN steel's resistance to atmospheric corrosion is slightly superior to that of copper steel.

Because U·S·S TRI-TEN steel has very good welding properties in intermediate and heavier thicknesses, this grade is particularly recommended for application in heavy-duty equipment, such as illustrated (right), where maximum ruggedness and strength with minimum weight are prime requisites.

U·S·S TRI-TEN steel is produced in plates, structural shapes, bars and bar shapes.

**During the present critical shortage of nickel, an emergency manganese-copper-vanadium grade, identified as U·S·S TRI-TEN "E" steel is being produced in place of U·S·S TRI-TEN steel. It has equivalent engineering values and its use is recommended in place of U·S·S TRI-TEN steel.*

U·S·S A-R STEEL

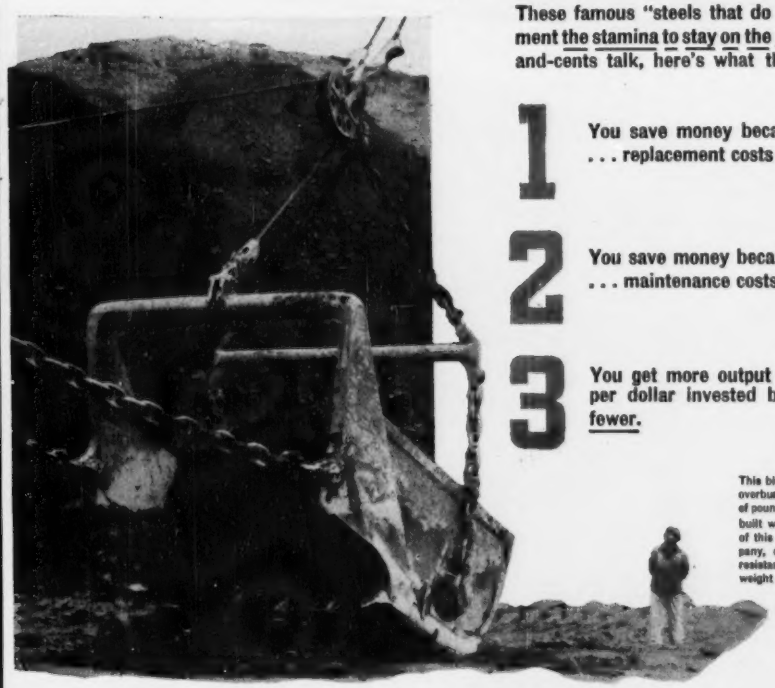
Here is a low-cost, abrasion resisting steel that was developed especially to meet the needs of the mining and other materials handling industries.

U·S·S A-R is an intermediate carbon-manganese steel, with better workability than plain carbon steel of the same hardness level. Its surface hardness ranges from 200 to 250 Brinell.

A-R steel has many applications in the mining field. Its use has decreased the number of breakdowns and lengthened the life of such equipment as chutes, buckets, conveyors, screens, picking tables, separators, loading booms, skid plates, etc.

U·S·S A-R steel is available in strip, sheets, universal mill plates, sheared plates and bars and bar shapes. It can be machined, drilled, sheared, punched, welded and hot and cold formed, although certain precautions and special equipment are sometimes necessary because of the product's exceptional hardness.

with U·S·S High Strength Steels



These famous "steels that do more" give your equipment the stamina to stay on the job. And in plain dollars-and-cents talk, here's what that means to you. . . .

1 You save money because equipment lasts longer . . . replacement costs are lower.

2 You save money because less servicing is needed . . . maintenance costs are lower.

3 You get more output (and therefore more profit) per dollar invested because work stoppages are fewer.

This big baby can scoop up 30 cubic yards of coal or overburden in one bite. That means it has to take a lot of pounding and grinding. And it can . . . because it was built with U·S·S TRI-TEN steel. The manufacturer of this king size dragline bucket, Bucyrus-Erie Company, chose TRI-TEN steel to obtain high impact resistance at low temperatures, high tensile strength, weight reduction and improved welding qualities.

WITH these famous high-strength steels; U·S·S COR-TEN, U·S·S TRI-TEN, and U·S·S A-R, abrasion resisting steel, all parts ordinarily prone to fail can be made highly resistant to wear, fatigue, abrasion, atmospheric corrosion and shock. You get maximum strength and durability, and therefore maximum use from your equipment.

But that's not all!

U·S·S High Strength Steels have a yield point 50% higher than that of ordinary structural steel. That means you can increase the strength of parts *without increasing weight*. Or, you can use one of these steels in lighter sections to *reduce* weight without reducing your present level of strength. In either case, a substantial saving in steel may result.

For 17 years, our engineers have cooperated with the mining industry in applying U·S·S High Strength Steels. They'll be glad to show you how these tougher, stronger, more durable steels can be applied to give your equipment the stamina to stay on the job.

UNITED STATES STEEL COMPANY, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S HIGH STRENGTH STEELS

USS

2-1428

UNITED STATES STEEL

WESTERN DUMP

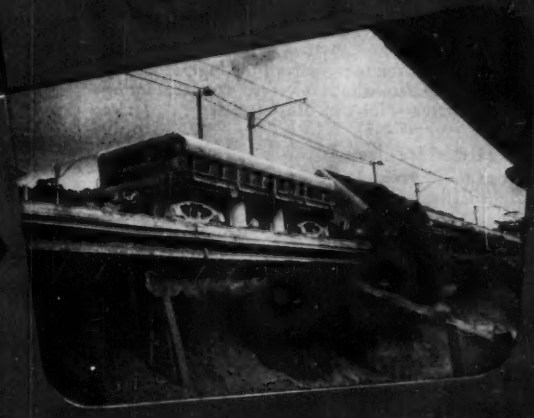
WESTERN—built by the world's largest manufacturers of dumptrucks

BALDWIN

Philadelphia 42, Pa.

CARS

strip Ruwe Mine, Belgian Congo



-LIMA-HAMILTON

Offices in Principal Cities

cut tonnage costs

with P&H ELECTRIC SHOVELS

In more and more locations these ultra-modern P&H machines are taking over the jobs that call for big production — steady digging. Users who know their cost accounting come back for more — for one proved reason . . . *lower tonnage costs.*

Contributing factors are these:

P&H Magnetorque* Hoist Drive powers hoisting motions electro-magnetically, gives you snappier dipper action — eliminates hoist generator, slip friction clutch and other troublesome mechanical devices.

P&H stepless power regulation is smooth and accurate — with no control fingers or contactors to give you trouble.

Independent propel, all-welded construction, filtered air cab and other modern refinements have led the way to more dependable production on a year-in, year-out basis.

If you seek lower tonnage costs in open pit work, let us tell you where you can see a P&H Electric Shovel in action. Ask about a P&H today.

*T.M. of Harnischfeger Corporation for electro-magnetic type clutch

Every third P&H Electric Shovel sold is a repeat order

HARNISCHFEGER
CORPORATION

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES

A gravel pit owner reports . . .

J & L JALLOY

"HAD 'EM SKUN A MILE"

At Left—Walter Stevens holds up J&L Jalloy cutting edge which lasted 2½ years before replacement. Only ⅛" thinner than when new.

Above—It takes tough steel to withstand digging material like this!

Above—Walter Stevens rams loader bucket into gravel bank to pick up another load of gravel.

MAINE STEEL INC. uses tough J&L JALLOY to decrease "Downtime" on Hydraulic Loader at H. H. Stevens Co.

We're pretty pleased with the way Mr. Walter Stevens of H. H. Stevens Sand & Gravel, Gorham, Me., feels about J&L Jalloy.

Mr. Stevens is using a "Straight-Line" hydraulic loader, built by Maine Steel Inc., to load trucks with the sand and gravel from his pit. It's tough work. The loader bucket is rammed into the gravel bank at high speed reverse, which means the severest kind of impact and abrasion on the equipment.

To decrease service interruptions to the work of its loaders, Maine Steel has used ⅛" x 6" Jalloy plate for the bucket's cutting edge.

Here's how Jalloy has worked out—

Mr. Stevens reports, the first cutting edge of Jalloy lasted 2¼ years—loaded 40,000 cubic yards of sand and gravel.

Mr. Stevens sums it up this way. "*That blade saved me quite a bit of money.*"

And Maine Steel Inc. is pleased with J&L Jalloy too—

P. J. MacDonald, Maine Steel Welding Foreman, reports Jalloy is no trouble at all to weld using a regular coated rod.

Finally, Mr. G. C. Soule, President of Maine Steel, says that HE'LL CONTINUE TO SPECIFY J&L JALLOY FOR ALL CUTTING EDGES.

Why not write today for our booklet, "*For Longer Wear . . . Less Repair.*" It will give you complete information on Jalloy, plus examples of how other mining and quarrying men are using this modern mining steel to save them money. The coupon is for your convenience.

J&L STEEL

Jones & Laughlin Steel Corporation
412 Gateway Center
Pittsburgh 30, Pa.

Please send me a free copy of your booklet, "For Longer Wear . . . Less Repair."

Name_____

Company_____

Address_____

_____

JONES & LAUGHLIN STEEL CORPORATION PITTSBURGH 30, PA.

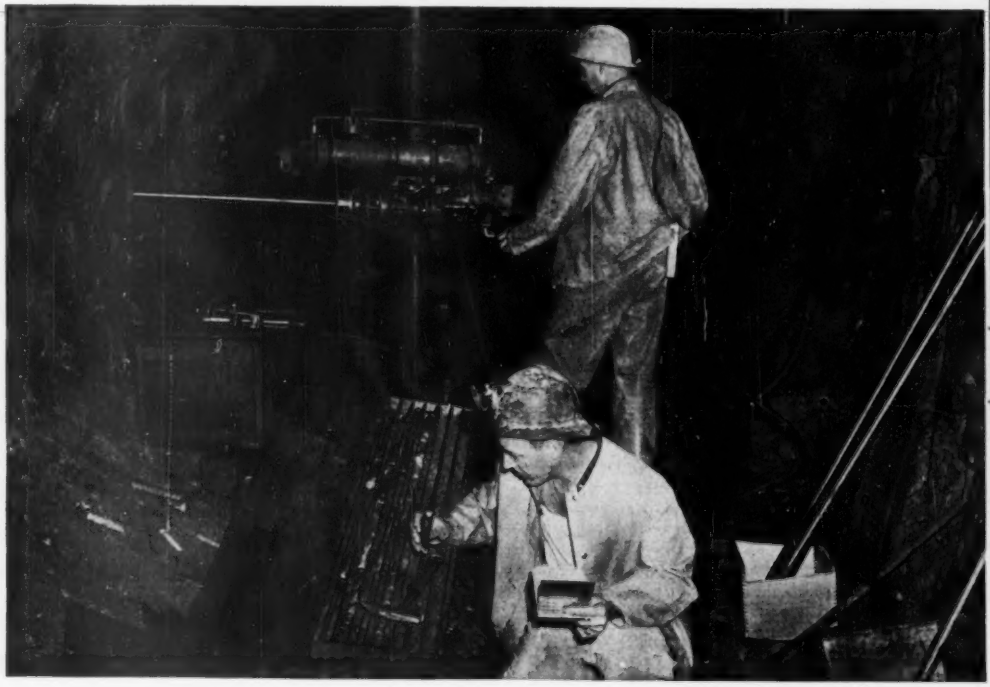
The compact design of CP ROTORdrifters — with rotary feed motor built into the drill between backhead and drifter cylinder — makes them particularly suitable for close-quarter operations.

CP MOTORdrifters — with feed motor on the end of the shell — are specifically designed for the longer feeds sometimes preferred in large bore tunnels.

Every type of ROCK DRILL

for modern mining

Designed both for blast hole and exploratory drilling, the air-driven CP No. 55 DIAMOND CORE DRILL has the most powerful vane-type air motor ever built into a diamond drill. Conservatively rated at 500 feet with E Rods and EX Fittings.



CP-34 STOPERS have all the features that assure maximum footage from tungsten-carbide bits. The combination of strong rotation, fast hitting action, and the right foot-pound blow give maximum penetration and long bit life. Medium weight, fully cushioned piston and fine running balance make the CP-34 easy to handle. Constant air blow keeps all sludge out of the drill.

For the toughest drilling jobs, the heavier CP-44 STOPERS are recommended.

The complete line of CP SINKER DRILLS, ranging from the CP-22 (28-pound) to the CP-50N (102-pound), includes the CP-32, a top performer in the 45-pound class, and the CP-59, leader in the 55-pound class. Both of these can be furnished with the CP AIRLEG, which provides a rigid, well-balanced support and effectively absorbs all recoil.

Designed for maximum speed and efficiency in tunnel driving, the rail-mounted G-600 AIR ACTUATED DRILL JUMBO is furnished in single and multi-boom units.

OTHER CP MINING EQUIPMENT

Exploratory Diamond Drills, gasoline, air and electric powered . . . Wagon Drills . . . Sludge Pumps . . . Sump Pumps . . . Pneumatic Impact Wrenches . . . Stationary and Portable Compressors . . . Pneumatic and Electric Construction and Maintenance Tools.

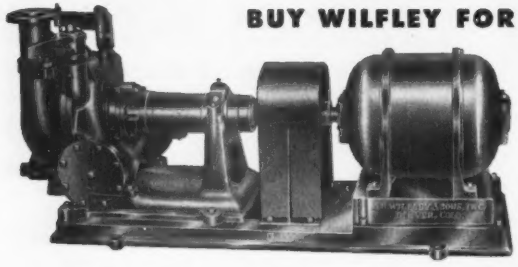
CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

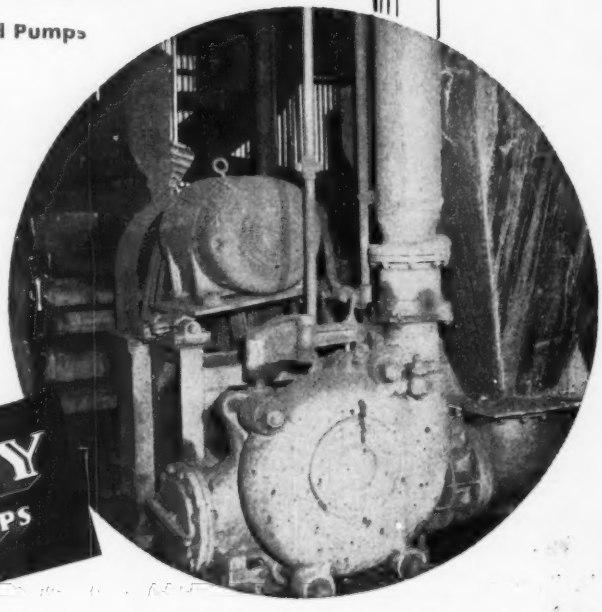
heavy media

BUY WILFLEY FOR COST SAVING PERFORMANCE



Companion to famous Wilfley Acid Pumps

This Wilfley Model K *pump is extremely effective in heavy media circuit and thickener circuit work in coal washing operations. Specifically designed for rugged, heavy duty performance, delivering continuous, trouble-free operation at low cost without media loss, leakage or dilution.*



WILFLEY
centrifugal PUMPS

In modern plants **all over the world dependable, highly efficient Wilfley pumps are on the job, operating 'round-the-clock without attention. Available in sizes that meet every pumping requirement. Individual engineering on every application... Write or wire for complete details.**

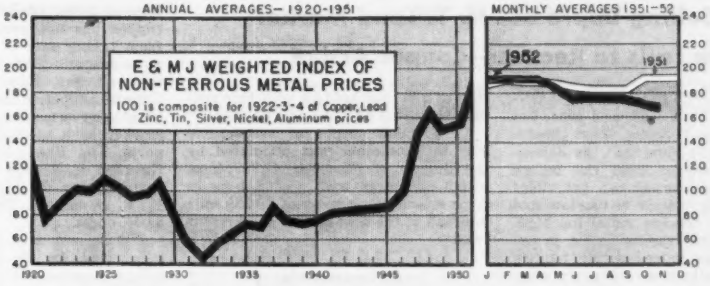
A. R. Wilfley & Sons, Inc.

Denver, Colorado, U.S.A.

New York Office: 1775 Broadway, New York

E&MJ OUTLOOK

PRICES



MARKETS

Stemming from lower prices abroad, lead and zinc eased downward in November, thereby pushing the *E&MJ* index of nonferrous metal prices to 172.04, against 173.85 in October. A new low for the movement, this marks a drop from 195.10 in February.

A steadier market is in sight, although trading in zinc on the London Metal Exchange is definitely set for Jan. 2, 1953. There's likely to be a more orderly handling of surplus metal than for lead recently.

Copper producers, hoping for decontrol, will probably have to wait for the new administration to do it. Demand for metal is strong as ever.

•

LABOR

Despite its anti-Republican outcries, Mine, Mill doesn't really fear the new administration's labor policy. Its leaders see little change in prospect. They do hope, however, to get back into the CIO.

•

AT HOME

The outlook is still bright for business generally for the first six months of 1953. Consumer buying is slower than last year at this time, but is still good. Don't forget that employment is away up and the new administration will do its considerable best to keep it there.

U. S. metal mining may ride along at a somewhat lower level than in 1952. Demand will be good, but there's constantly more talk, in top-level Republican circles, of buying raw materials abroad to save money and to boost imports. "Trade, not aid" is a frequently-heard foreign policy slogan.

Add Olin Industries to the list of aluminum producers. They've announced construction plans for a 110,000-ton-a-year plant.

With 11 new cargo carriers added to the Lake shipping fleet, next year's goal of 105-million tons of iron ore down the Lakes should be reached easily. Total this season, just closed, was 75-million tons, down because of the steel strike, but still enough for the winter.

Underground iron ore mines may move for a higher ore price early in 1953. Last increase, they claim, doesn't cover new wage rates.

•

ABROAD

Canada's aid to her gold mines goes higher in 1953. Maximum subsidy will increase from $11.50 to $13.50 per oz. New rate will be one-half the excess of production cost per oz. over $18, with a maximum of $13.50.

Feeling that gold is in for a price rise grows stronger. The Republicans had a "gold standard" platform, but they're not in a hurry to put it into effect. Eventually they may try a higher price as an "easy way" to strengthen world currencies, but most experts oppose it.

Bolivia may have a long-term tin contract with the U. S. by the time you read this, but we wouldn't bet on it. Stumbling block is our government's insistence on buying only metal which the seller really owns.

MARKETS—Trends and Prices

London Selling Depresses N. Y. Lead Market—Zinc Price Fails to Recover—Copper Active

PRICE UNSETTLEMENT CONTINUED in both lead and zinc, but copper remained strong. Most observers cling to the view that the domestic price of copper must rise before a corrective movement can get under way. Domestic copper is too low and top prices on foreign metal too high. Though private trading in tin is expanding, prices moved within narrow limits. Quicksilver rose sharply on a squeeze in spot metal and high estimates on probable 1953 needs.

The *E&MJ* index of nonferrous metal prices declined again, from 173.85 in October to 172.04 in November. A year ago it stood at 193.17. Lower averages for lead and zinc depressed the index. Prompt tin was a shade lower in the open market. The weakness in both lead and zinc resulted from selling pressure outside this country, chiefly apparent in the movement of prices on the London Metal Exchange.

U.K. to Free Zinc

Resumption of private trading in zinc has been sanctioned for the U.K., beginning Jan. 2, 1953. Trading in zinc on the London Metal Exchange will begin officially on that date, the first business day of the new year. The Ministry of Materials has announced that it is its policy to release from its stocks of zinc not more than a relatively small tonnage for sale during the early months after the resumption of private trading. The arrangements for disposal of Ministry stocks, it was revealed, have been arrived at in full consultation with producers, consumers and members of the London Metal Exchange.

In view of the badly muddled state of the London lead market that occurred after trading resumed on the Exchange, producers in the United States can only hope that undue pressure on zinc will not develop. The price of zinc in the world market has dropped sufficiently, it is generally maintained, to bring a measure of caution into the picture. Prevailing prices should reduce output here and abroad.

The October statistics of the American Zinc Institute placed U. S. production of slab zinc at 80,588 tons, which compares with 76,019 tons in September and the high for the year of 85,028 tons in March. Total shipments increased in October to 84,548 tons, resulting in a decline in stocks of about 4,000 tons to 90,581 tons. At the current quotation of 12½¢ for Prime Western, East St. Louis, producers appear to be more inclined to accumulate metal. Actual consumption of zinc has held up well throughout the period of price unsettlement.

U. S. mine output of recoverable zinc in September was estimated by the Bureau of Mines at 47,729 tons, which compares with 49,402 tons in August and an average of 60,239 tons a month in the first half of the current year.

Lead Imports Heavy

During September, the United States imported 45,906 tons of refined lead, making the total for the Jan.-Sept. period 330,995 tons. Total imports of refined lead in 1951 came to only 178,903 tons. In 1951, it will be recalled, consumers and speculators situated abroad bought heavily at premium prices. Since then, all fear of a famine in lead has vanished, prices weakened, and offerings to U. S. consumers from all quarters have been large, notwithstanding falling prices. Another development of importance has been the slackening rate of activity in purchases for the strategic stockpile.

The import duty of 1 1/16¢ on refined lead has not kept foreign metal from coming into the country. Circumstances that caused foreign producers to offer the metal to U. S. consumers rather freely, included: (1) reduced European demands, (2) return to free trading in London, and (3) the dollar shortage. The existing wide gap between the London and New York quotations has revived talk of additional tariff protection for the domestic industry.

New York quotations fluctuated with those of London. On a showing of strength in London, the price here was raised from a low of 13½¢ as November opened to 14½¢ by midmonth. On the rise the demand was quite active and sellers expected prices to hold over the remainder of the month. The rise, in part, reflected optimism over reports, subsequently denied, that our government intended to increase its stockpile purchases. Selling pressure in London moderated toward the end of the month and prices in the U. S. market steadied. Marketing of surplus lead in London after private trading resumed on Oct. 1 has been far from orderly. U. K. consumers obtained all the lead they asked for at falling prices.

U.S. Copper Still Active

Domestic fabricators continued to absorb all the copper they could get. The wide spread between the fixed domestic quotation of 24½¢ and the high of 36½¢ (delivered) for foreign copper has not prevented consumers from taking care of their total needs at an average price that is lower than that of any other major market. Chilean copper, under prevailing unusual circumstances, found a ready market here at 35½¢, f.o.b. Chilean ports. The Rhodesian producers and Katanga took care of their regular customers on the basis of 33½¢, f.a.s. N. Y. equivalent. The strike in Rhodesia ended.

With a new administration soon to take hold in Washington, pricing policy is certain to be more realistic. There is hope that the controls on copper will be dropped before the end of the first quarter. The steel industry has recommended that allocation of steel for the civilian economy should end by April 1. It has been suggested that a special assistance group within the Iron and Steel Division of NPA be named to give positive procure-

Average Prices for November (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	24.200
Electrolytic, export, refinery	34.681
Lead:	
Common, New York	14.159
Common, St. Louis	13.959
Silver and Sterling Exchange:	
Silver, New York, per oz.	83.250
Silver, London, pence per oz.	72.869
Sterling Exchange, "Checks"	280.018
Zinc:	
Prime Western East St. Louis	12.500
Tin:	
New York Straits	121.284
New York, 99% min.	(e)120.284
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	201.818
Antimony (E&MJ) (d)	38.175
Antimony, bulk, Laredo	34.705
Antimony, in cases, Laredo	35.205
Platinum, refined, per oz.	90.000
Cadmium (a)	200.000
Cadmium (b)	207.500
Cadmium (c)	215.000
Aluminum, 99% plus, ingot	20.000
Magnesium, ingot	24.500
Nickel (f)	56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.

Markets Continued on Page 134

ment assistance to emergency needs. Copper producers entertain similar views.

Copper fabricators have been adding to their inventories. Once price disparities end, the outlook points toward an improved supply situation.

In miscellaneous metals, price competition in cadmium has caused the price to fall to $1.50 a pound, effective Dec. 1. Quicksilver moved up on unofficial estimates that U. S. needs in 1953 may rise to more than 80,000 flasks. Only an upturn in "restricted" business could bring about so sharp an increase in U. S. requirements, trade authorities believe.

"Free" Gold Market

Market volume in "free" gold was slightly lower than in the preceding month. Prices declined under pressure of privately newly minted coins. There are now three manufacturing centers for such coins, namely Milan, Torino, and Damascus. Pick's World Currency Report quotes, per fine oz., as follows:

	COINS		BARS (12.5 kg.)	
	Oct. 31	Nov. 29	Oct. 31	Nov. 29
NEW YORK, transit	.....	.....	$37.35	$37.00
MANILA	$47.50	$46.00	37.30	37.05
HONG KONG	47.50	46.00	40.75	40.15
BOMBAY	49.00	48.25	45.50	43.50
TANGIER	50.75	48.50	37.55	37.10
BEYROUTH	50.00	48.00	37.60	37.15
PARIS	50.50	50.60	39.10	38.30
BUENOS AIRES	47.00	46.50	40.75	39.75

Major Metals

U. S. DAILY AND AVERAGE PRICES

Nov. 1952	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
1	No Market	34.350	121.125	13.500	13.300	12.500
3	24.200	34.675	121.125	13.625	13.425	12.500
4	Holiday	34.150	Holiday	Holiday	Holiday	Holiday
5	24.200	34.675	121.125	14.000	13.800	12.500
6	24.200	34.675	121.125	14.000	13.800	12.500
7	24.200	35.050	121.250	14.000	13.800	12.500
8	No Market	34.225	121.250	14.000	13.800	12.500
10	24.200	34.850	121.250	14.125	13.925	12.500
11	Holiday	35.325	Holiday	Holiday	Holiday	Holiday
12	24.200	34.625	121.250	14.500	14.300	12.500
13	24.200	34.825	121.250	14.500	14.300	12.500
14	24.200	34.700	121.250	14.500	14.300	12.500
15	No Market	34.125	121.250	14.500	14.300	12.500
17	24.200	34.925	121.250	14.500	14.300	12.500
18	24.200	34.875	121.250	14.500	14.300	12.500
19	24.200	34.575	121.250	14.500	14.300	12.500
20	24.200	34.950	121.375	14.250	14.050	12.500
21	24.200	34.975	121.375	14.250	14.050	12.500
22	No Market	33.925	121.375	14.250	14.050	12.500
24	24.200	35.075	121.375	14.000	13.800	12.500
25	24.200	35.400	121.500	14.000	13.800	12.500
26	24.200	34.950	121.500	14.000	13.800	12.500
27	Holiday	33.850	Holiday	Holiday	Holiday	Holiday
28	24.200	34.775	121.375	14.000	13.800	12.500
29	No Market	34.500	121.375	14.000	13.800	12.500
AVERAGES FOR MONTH						
Nov.	24.200	34.681	121.284	14.159	13.959	12.500
AVERAGES FOR WEEK						
Nov.						
5	24.200	34.500	121.275	13.625	13.425	12.500
12	24.200	34.792	121.225	14.125	13.925	12.500
19	24.200	34.671	121.250	14.500	14.300	12.500
26	24.200	34.879	121.417	14.125	13.925	12.500
CALENDAR WEEK AVERAGES						
Nov.						
1	24.200	34.746	121.438	13.500	13.300	12.500
8	24.200	34.575	121.175	13.925	13.725	12.500
15	24.200	34.742	121.250	14.425	14.225	12.500
22	24.200	34.704	121.313	14.375	14.175	12.500
29	24.200	34.758	121.425	14.000	13.800	12.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Nov. 1952	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	(e)	(e)	(e)	(e)	$35.00
3	280.2500	83.250	73.000d.	248s.	35.00
4	Holiday	Holiday	73.000d.	248s.	Holiday
5	280.2500	83.250	73.000d.	248s.	35.00
6	279.7500	83.250	72.875d.	248s.	35.00
7	279.7500	83.250	72.875d.	248s.	35.00
8	(e)	(e)	(e)	(e)	35.00
10	279.7500	83.250	72.875d.	248s.	35.00
11	Holiday	Holiday	72.875d.	248s.	Holiday
12	279.7500	83.250	72.875d.	248s.	35.00
13	280.0000	83.250	72.875d.	248s.	35.00
14	280.0000	83.250	72.875d.	248s.	35.00
15	(e)	(e)	(e)	(e)	35.00
17	280.0000	83.250	72.875d.	248s.	35.00
18	280.0000	83.250	72.875d.	248s.	35.00
19	280.0000	83.250	72.875d.	248s.	35.00
20	280.0000	83.250	72.875d.	248s.	35.00
21	280.0000	83.250	72.875d.	248s.	35.00
22	(e)	(e)	(e)	(e)	35.00
24	280.0000	83.250	72.875d.	248s.	35.00
25	280.2500	83.250	72.750d.	248s.	35.00
26	280.3750	83.250	72.750d.	248s.	35.00
27	Holiday	Holiday	72.750d.	248s.	Holiday
28	280.1875	83.250	72.750d.	248s.	35.00
29	(e)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
Nov.	280.018	83.250	72.869	—	35.00
AVERAGES FOR WEEK					
Nov.					
5	280.172	83.250	—	—	—
12	279.750	83.250	—	—	—
19	280.000	83.250	—	—	—
26	280.125	83.250	—	—	—

Calendar Week Averages, New York Silver: Nov. 1st, 83.250; 8th, 83.250; 15th, 83.250; 22nd, 83.250; 29th, 83.250.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

First order of business this month is to straighten out the Nigerian Department of Commerce. Apparently they have been passing the word to eager Nigerian businessmen that we are in the export-import business. At least *E&MJ* got an offer last month to buy the following items:

Butter Beans	£45 per ton
Black Pepper	£325 " "
Chillies	£300 " "
Cow Skins 1st. Grade	7/6d per lb.
Cow Horns	£85 per ton

If you haven't finished your Christmas shopping yet, how about a ton of cow horns for the Hopalong Cassidy set in your home? We'll be glad to tell you where they are available. As for *E&MJ*, we are definitely not in the export-import business and not even a boatload of Nigerian chillies at a mere £300 per ton can tempt us.

You are hereby invited to dust off your old pirogue, put on your rubbers, and take a trip down to the Louisiana bayou country. On page 98 you will find the interesting story of how Freeport Sulphur Co. is launching their floating mining project down at Bay Ste. Elaine. As far as we know, this is the only waterborne, underground mining project in the world.

Before you make an unkind remark about our copy reading, you should know that the "Ste." in Bay Ste. Elaine is "Ste." and not "St." on purpose. This is because the name is French, and the French are such people as are very much concerned with this matter of masculine and feminine in their language. In fact the French are reputed to be experts in all matters male and female, and we are in no position to tamper with their judgment.

Other eye-catching items in this issue (besides the doll on the left) are: A floating mine car axle for smoother haulage (p. 114), sent in by Phil Keast of the *Empire Star*, veteran contributor to Operating Ideas. . . . Also in Op Ideas, a gadget for faster stripping of cathode bars (p. 114). . . . Another big headframe is being moved on p. 76. . . . In New Products Digest, engineers and machinists alike will be interested in the $3 Special on p. 121. . . . There's a change in attitude on lightweight, airleg drills in Canada (p. 105). . . . And get the low-down on the Bolivian situation from a group of displaced engineers (p. 137).

As for the eyetem just above, she's one of the famous "Springmaid Girls" usually found decorating those provocative Springmaid ads. You can get full color decals of this girl and five friends for any interior decorating you may care to do. Just send 25¢ for a complete set, to Meyercord Co., 5323 W. Lake St., Chicago 44, Ill.

"Dead Fish Situation Being Studied," is the appetizing heading of a release we received this month from the Department of the Interior. Frankly, we read no further as the only dead fish we are interested in is the one that our fool cat dragged under the back porch last summer. If we don't get rid of that soon . . . About this release though; we hopefully assume it refers to the last of the infamous red herrings, as the old administration goes about the task of sorting out the junk that is bound to accumulate on the premises over a period of 20 years. We're glad to see that preparations for the new administration are under way.

And while we are on the subject, we hear that a record company has offered a prominent Washington letter writer $40,000 to record four piano solos as soon as his present employment terminates.

There's a new snake-bite kit on the market which is bound to be a disappointment to a goodly number of prospectors we know. This kit contains tourniquets; lancet for opening fang punctures; ammonia inhalants, of all things, for shock; iodine swabs; adhesive bandages; and even a Saunders venom-suction pump with adapters. All this and no *real* snake-bite remedy! We take a dim view of people flying in the face of snake-bite tradition like this. However, if you want to get one of these kits, complete with venom-suction pump, but without a pint of Old Buzzard, write Medical Supply Co., 1027 West State St., Rockford, Ill.

What the mining industry needs is a good public relations program. In the words of that little seedy, somewhat bleary-eyed, unsteady gentleman at the end of the bar, "Nobody understands us." Apparently our approach to better understanding is to sit around at meetings and conventions and tell each other how vital the mining industry is to the nation's economy and defense (and mine operators?), and how terrible are the wrongs that Washington is heaping on mining.

We got a good close-up of how little the average citizen understands about mining when we recently addressed a group of fellow townsmen on the subject. These men were genuinely startled to learn how much went into mining a pound of copper, and they still don't believe that any self-respecting gold mine could conceivably contain less than 1 oz. of gold in a whole ton of rock. Until then their knowledge of mining and its problems had been limited to the Seven Dwarfs and a couple of choruses of "Clementine." They were interested and for the most part favorably impressed. It just seems that if the industry could organize to inform the people of the mining facts of life, the people could be a big help.

She's deep enough. Merry Christmas!

ENGINEERING AND MINING JOURNAL

DECEMBER, 1952

A Groove To Rub Out

EVERY SO OFTEN this past month we have caught ourselves slipping into that old mental groove worn by indignation and despair with which we have regarded so many activities of government these past 20 years.

Then we remember, each time with the same pleasant glow, that we had better rub out that groove in our thinking. It was time for a change in Washington, and there *was* a change. Perhaps it is time for a change in our attitude toward Washington.

However, old habits die hard. Let's take a look for a moment at what Washington's attitude is likely to be, as it will affect the mining industry.

The immediate outlook, it's true, hasn't been changed much by the election. Defense spending will carry on at scheduled rates through most of 1953, and there's nothing much the new administration can, or would, do about it. Eisenhower has promised to cut yearly government spending by $20-billion, but it's apparent he couldn't do it this year without disastrous results. It's also hard to see how he could do it in any one year, but we certainly applaud the proposal.

The new administration may cut taxes somewhat next year, particularly if the economy shows signs of running down. The Republican aim must be to carry out its programs without permitting a serious recession to develop. If this calls for tax cuts and deficit financing, we think the Republicans will answer the call.

Business for mining, in other words, ought to pick up gradually in the few low spots, hold its own, or slacken only slightly, in the high ones. Is the long-term picture any different?

First of all, it seems certain that business, including mining, can look for a healthier, more cooperative attitude in Washington. Eisenhower and the men he will bring to his cabinet and other top jobs in Washington will be utterly lacking the punitive philosophy that pervaded most government executive, and many legislative, actions for two decades. Nevertheless, Eisenhower's main support came from the liberal, younger Republican group, and we may expect that the government will still be very much with us—it could be wholeheartedly instead of constantly threatening our engulfment.

There'll be fewer politically inspired anti-trust suits, fewer annoyances of all kinds. There may be an end to many economic controls early next year. The CIO will no longer have the back-door key to the White House. The Department of Labor, and labor law in general, will be worked over, but there's no union-busting field day in sight. In the field of natural resources, Eisenhower has given vague promises, such as the provision of more reclamation projects but with less bureaucratic control, which are simply beyond human power to carry out. With a fresh enthusiastic Westerner in the Interior Department, however, a lot of that agency's ideological warfare on industry will be tossed right out the window.

Eisenhower believes firmly in strong support of the United Nations, and specifically in the necessity of a joint defense of Western Europe. Therefore, don't look for abandonment of sound foreign aid programs, including those concerning mining.

Among Eisenhower's top advisors are several men who believe that the United States can best help herself, and the world, by increasing substantially her imports of raw materials. This is mentioned by way of warning to those readers who look for a return to high protective tariffs and rigid "Buy American" programs. These men may not favor the Paley Report's "international buffer stock" idea, but they do believe that U. S. imports must be built up and that the least troublesome imports are raw materials.

Now what does all this mean to the mining industry? To us it seems to mean a long-awaited and very refreshing chance to work enthusiastically at our jobs, help our companies, or ourselves as individuals, to make a profit, and be proud of doing so.

Most importantly, however, it means that the mining industry can't sit back and wait for all the nice things it feels the new administration will prepare for it. As we've indicated, the new group may come up with some shockers if they are left unguided.

In the past, most mining industry members were reluctant, with good reason, to take jobs in Washington. It's time now to rub out that groove and meet the new administration more than half way. There are tremendous jobs to be done. Let's meet the new cooperative spirit down there with a spirit as cooperative of our own. If we don't, this time there'll be no one to blame but ourselves.

What the Paley Report

Knowing the Washington scene, from experience, nearly as well as he knows mining, Mr. Herres draws on both backgrounds to present his analysis of the report that is still agitating councils of mining men everywhere. It has some good points, he says, but also some faults you may have overlooked.

OTTO HERRES
Vice President,
Combined Metals Reduction Co.,
Salt Lake City, Utah

THE PRESIDENT'S MATERIALS POLICY Commission has attempted to outline the main features of the materials problems of the United States of America and the world, as it sees them, on the basis of the record for the year 1950 and its estimates covering the next 25 years. The conclusion reached is that there are no purely domestic materials problems, but only domestic aspects of world problems; these probably have no final solutions and may be compensated only by the ingenuity of mankind.

Self-Sufficiency Rejected

However its thinking may be on that point, the commission has recommended certain policies and programs which it believes will provide solutions to the materials problems, or at least will do much to alleviate threatened shortages and to stimulate economic growth and promote free world security. The major premise upon which all the rest of its report is based is the belief of the commission that the United States must reject self-sufficiency as a policy and instead go for the lowest cost acquisition of materials wherever secure supplies may be found. To reach this conclusion, the commission proceeds on the assumption that things will continue much as they are.

Because the economy is running high, apparently it will continue to run high; for the reason that international tension exists, there will not be any sudden end to the tensions; nor will there be any specific changes in the present world political alignment, according to the commission's reasoning.

Recent years have seen shortages of materials and full employment. Consequently the commission assumes our economy may be expected to follow much the same pattern of shortages and full employment for the next quarter century. Its concept of full employment and a world solution of the materials problems seems to be based on the assumption that government planners can regulate production better than a free market and the law of supply and demand. The report indicates a high regard for the "Promise of Technology," but makes comparatively little use of it as a factor in its projections of individual materials and energy sources.

The policies and programs recommended by the commission are concerned with ways of stabilizing supplies and prices of commodities on a global scale by means of world agreements on production and distribution of raw materials, the establishment of international stockpiles, and particularly the elimination of import duties, especially on metals and minerals. The commission strongly favors government assistance, financial and otherwise, to promote foreign investments directed toward the expansion of foreign materials production.

The Paley Report offers a valuable fund of information relating to key commodities and energy sources. In the five volumes the mining industry will find a useful compilation of facts concerning its products and problems.

Research and Exploration

The commission has made a very real contribution by emphasizing the importance of research and exploration work, both in this country and abroad, and the great opportunities for further progress. American industry is fully aware of this vital need and has done much to extend our industrial horizons. With proper encouragement, greater progress lies ahead. Already the accomplishments of science and technology under a system permitting individual freedom have brought to American workers the most pay and the highest living standards in the world. Consideration of these accomplishments and of prospective tasks and opportunities possibly will serve somewhat to clear up the delusion that all betterment of the individual has come about from the activities of politicians and labor leaders.

Tax Incentives

Recognition is given by the commission to the effectiveness of tax incentives in stimulating the discovery and development of new sources of essential raw materials. In contrast to other forms of government aid recommended in the Paley Report, the use of tax incentives does not involve interference with private initiative and management by government agencies. The report indicates that attacks in Congress on depletion allowances by the Treasury Department and others are short-sighted and ill-advised. The experience of the petroleum industry is cited to show that tax incentives serve to stimulate the discovery and development of new reserves of essential materials. Rather than drop tax incentives, Congress should study ways of broadening the use of this means of encouraging progress in fields other than petroleum, according to the commission's findings.

The commission has recommended specific programs for the

Means to U. S. Miners

aid and assistance of the domestic mining industry. Of far greater importance in their ultimate effect on the industry, however, are the principles and policies laid down in the report. No particular program can be considered intelligently without examining the policies and objectives upon which it is based. For this reason thought must be given to the major premise of the report, and the assumptions and beliefs enumerated by the commission and its staff, before going into individual recommendations.

The commission looked at conditions in the year 1950 and saw full employment in the United States, a world shortage of raw materials, international tensions, and rising prices. Proceeding upon the assumption that this state of affairs is normal, at least to the extent that the trend may continue relatively unchanged, it foresees developing shortages and rising costs which will endanger the nation's security and living standards. Concern over rising costs seems fully warranted at this time, but the impact of higher costs on prices and the leveling influence of world competition have a way of relieving shortages.

The remedy for shortages and rising costs, the commission believes, is low-cost acquisition of commodities in world trade, to be obtained by our investment in the development of foreign resources. The United States must reject ideas of self-sufficiency and eliminate tariffs on raw materials obtained from abroad. Private enterprise is encouraged to do the work, but the fundamental concept involves a mixture of private and public influences on our economy. The commission, like the Washington planners, believes that the coexistence of great private and public strength in our economy is essential to our preservation.

Government Controls

In the commission's concept, the government would exercise more control over raw materials, the lands from which they are produced in this country, and the financing of their production abroad. In cooperation with other governments, there would be world agreement on production and prices, and there would be international stockpiles and commodity pools. Our State Department for years has been endeavoring to gain congressional approval of a charter for an international trade organization authorized to make inter-governmental commodity arrangements covering any agricultural product or mineral which enters world trade in substantial volume. It would seem that there is a striking similarity in the commission's recommendations and the Department's views.

Experience Differs

The experience of the domestic mining industry differs from the commission's assumptions and beliefs in many respects. In contrast to the commission's assumption that existing conditions will continue and therefore constitute a reasonable basis for predicting the future, industry has found that nothing is so certain as change. Looking back over the political, industrial and scientific developments of the last 25 years bears this out. We see atomic energy, electronics, world wars, great advancement in the production of light metals, plastics, synthetic fibers, and revolutionary improvements in forms of communication and transportation, among the drastic changes that are affecting our way of living and our use of materials.

In some respects the domestic mining industry finds the commission's recommendations inconsistent. The nation is urged to reject self-sufficiency, but the commission states: "Despite progressive increase in imports, the nation still will look to its own reserves for most of its mineral supply." By discovery, beneficiation, or synthesis, the commission finds that the supply of most of the industrially important minerals may be increased in the United States except chromium, nickel, tin, cobalt, platinum and mercury. This does not quite agree with the have-not emphasis of the report; there is increased production of cobalt already in prospect in Idaho and Missouri.

Shortages Forever?

Nor is it possible to agree entirely with the commission's views that shortages of raw materials and full employment will continue largely unchanged for the next 25 years. We are in a period which follows 10 years of the Great Depression, and another 10 years of world war and postwar aggression. Even now Asiatic war goes on, seemingly without end.

There were no shortages of raw materials during the first 10 years of this period until the outbreak of World War II. For the following 10 years and continuing into the present, the shortages and full employment have come about by the demands of war and rearmament, civilian needs deferred because of depression and war, and inflationary spending. Except in times of crisis and emergency, the mining industry in the United States has found surplus production, unstable prices, and competition with materials produced under low foreign living standards to be more of a problem than shortages. No great change is anticipated in this respect unless another world conflict develops.

In fact, the nation's self-sufficiency seems to be increasing. The ratio of imports to production has fallen in the United States from some 5.2% in 1929 to approximately 3.3% in recent years. European nations have come to depend a great deal on food and materials produced in this country and Canada. We have been pursuing a policy of supporting our exports and a gigantic surplus by means of economic aid and gifts to Western Europe and to much of the rest of the world that is not under the domination of Soviet Russia. Our participation in world trade rests on high taxes at home and charity abroad, sustained for the time being by inflationary credit and monetary policies.

The conclusion may be true that there are no purely domestic materials problems but only domestic aspects of world problems. Whether or not that is the case, the report makes little mention of the long-term solution of world

materials problems which is an end to inflation in this country and the restoration of freely convertible currencies in international trade. Europeans and the British have come to understand that survival for them depends on a non-inflationary policy. They must increase their production and the productivity of their industries and obtain more of their food and raw materials in countries outside the United States and Europe. There seems to be no sound alternative. Americans in time probably will come to the realization that they are living again in a competitive world when nations struggling to survive take less of our production and send us more of theirs.

Case For Tariffs

Other countries look upon the United States as a high-living and a high-cost country, paying wages ranging from double to many times earnings elsewhere. The Paley Commission recommends, but with some qualifications, the elimination of import duty on any industrial material. When a country known to the rest of the world for its high wages, high costs, and high living eliminates import duties, its workers and industries are in competition with lower wages, lower costs, and lower living standards. World prices then are established by competition and the many factors that bring balance to supply and demand. The experience of the mining industry is that world prices in the absence of crisis and emergency demands often tend to drop below the level required for the survival of industries essential to our national security. Then surpluses, rather than the shortages feared by the commission, cause the closing of American mines and unemployment of high-wage miners.

For example, the State Department last year in Torquay Trade Agreements negotiated a reduction in the tariff on slab zinc to 7/10¢ per pound. On a zinc price of 14¢ per pound, 7/10 amounts to 5% and is of no great consequence as a barrier to imports. Zinc imports since the first of the year have been heavy despite increasing domestic production. Recently the price broke from 19½¢ a pound to 13½ between June 1 and August 6. That experience is a repetition of what happened in 1949 when the price dropped from 17½¢ on March 23, to 9¢ by June 15. Yet before the end of the year 1950, government officials were pleading with the domestic industry to expand production because of a critical world shortage of zinc.

The Paley Commission, like the State Department, seems to believe that if producers see tariffs coming down, they can convert in various ways into new and productive occupations. The commission's recommendations might be extended to tell the mining industry to what it should convert, and where the world would be today if the advice had been followed when tariffs were cut too low in past years.

In fact, experience has taught the domestic mining industry not to place too much confidence in predictions and assumptions such as the commission's full employment and shortages for the next 25 years.

Not many months ago a government agency in Washington was saying, "No matter how much requirements may be increased or decreased, there is a shortage of the three basic metals, copper, lead and zinc, that is not going to be overcome right away." Industry experience indicated otherwise and already surpluses have caused heavy price drops in lead and zinc despite advancing wage scales.

In the commission's judgment, there are few cases where a protective tariff would be the best device for satisfying security needs of the nation. The commission advocates stockpiling, expansible capacity, long-term contracts and similar devices.

Stockpile at Home

The mining industry has urged consistently the stockpiling of metals and minerals for defense and emergency needs. It is believed, however, that the most efficient and economical procedure is to stockpile when output exceeds demand, and to adjust or suspend stockpiling purchases when critical shortages cause losses and delays to production in defense and essential industries.

The commission recommends that the "Buy American" provisions in the stockpile act should be repealed and support of domestic production, when essential, be accomplished by such other devices as subsidies and price premiums. To industry it seems evident that if the policy is "Buy Foreign," the only purpose that subsidies for domestic production would serve would be to build up a surplus and put producers who are not subsidized in competition with the low wages and lower living standards of foreign production. Rather the procedure should be to do what is best for America.

Serving Industry

The mining industry has confidence in the Geological Survey and Bureau of Mines and the services provided by the two federal agencies toward the development of the mineral resources of the United States by private enterprise. It is agreed that these agencies should be strengthened and given additional support as recommended by the commission, but this should be for activities to serve the mineral industries and not directed toward regulation, control or competition with private enterprise. Heavy emphasis is recommended by the commission upon analysis of the minerals position of the United States by professionally trained economists. To this should be added the qualification that professionally trained means that academic learning must be supplemented and seasoned by experience of consequence in industry.

The commission observed that "we need to map our country more completely so that better than the merely 11% which is now geologically described can become more familiar to us." If this is the case, it may be pertinent to ask whether it would not be more in the national interest to devote greater attention to the other 89% and a little less to the affairs of our neighbors. If we look into our undeveloped resources, perhaps we may be better off than some agencies of government would have it appear.

The British have found over the past 50 years that a policy of relying on cheap imports and a near monopoly in most manufactures cannot be sustained in a competitive world troubled with wars, colonial revolutions and aggression. Survival, as we shall learn in time, depends upon the strength of our economic and industrial structure, self-reliance and ingenuity.

Public Land Policy

With respect to managing resources on federal land, the com-

mission recommends changes in the mining laws. The mining industry is opposed to any change in the laws and believes that abuses and shortcomings in the functioning of the laws can be corrected by better administration and a more cooperative attitude on the part of the Bureau of Land Management toward the mining industry. Leasing as an alternative to the location of mining claims on the public domain is recommended by the commission and may have some possibilities under certain conditions but perhaps might prove to be only a transition stage that eventually would mean an end to further private ownership of mineral lands.

Financial Incentives

As to financial incentives in minerals, the commission recommends the continuation of percentage depletion as a strong inducement to risk capital to enter the mineral industries; also that the present limitations applicable to minerals other than oil and gas on the amount of permitted expensing of exploration cost be removed. It is believed that these recommendations are constructive and that experience will show them to be in the public interest.

For the purpose of encouraging small-scale mining, which has no opportunity to benefit from tax incentives, percentage depletion or expensing of exploration and development, the commission recommends incentives in the form of loans up to $100,000 for prospecting purposes. Small mines probably will find the proposal unattractive in many respects, not the least of which might be administrative difficulties and bureaucratic controls.

Industry advice is to the effect that price stability is the best way to bring about expanded domestic mineral production for the long range. This advice has been followed with good results for some of the scarcer minerals mined in relatively small tonnages in this country, such as tungsten and manganese, but not for such important ores as copper, lead, and zinc. A policy of flexible tariff protection would serve the purpose to some degree.

A bonus payable on new production from small mines would encourage the continued operation of prospectors and small mining concerns. The commission believes that encouragement in some form is important because these smaller operations provide an important pool of trained manpower available for expansion of minerals output in the event of emergency. The output from each mine or prospect that produced at a rate of less than a specified tonnage of metals might be considered new production. In most cases this tonnage is obtained by exploring for an ore deposit having possibilities that can be developed to make a mine of importance. Automatic administration and freedom from bureaucratic controls could be assured by having custom mills and smelters act as fiscal agencies of the government as is the case in the Silver Purchase Act. A bonus would provide the encouragement the commission believes desirable for the benefit of the nation on a broader base than the program of the Defense Minerals Exploration Administration.

Foreign Aid

In advocating foreign materials development, the commission recommends government-to-government special resource agreements, United States programs of technical assistance, long term purchase contracts for foreign-produced materials, government loans for foreign materials expansion, and government management contracts for the same purpose.

Although the emphasis of the commission's report seems to be placed on aid for expansion and production outside of the United States, experience teaches that national security requires a healthy mining industry with ample productive capacity and adequate working forces. To this end it is necessary to afford domestic mines at least the same price and other considerations and advantages given foreign properties by our government. Otherwise government competition with its citizens, in the form of the foreign production it would subsidize, could destroy domestic industry.

The commission believes in international arrangements for stabilizing the materials market, multilateral contract and buffer stock agreements, either with or without quota provisions on exports or production. In this conclusion the commission, it seems, supports the ambition of the State Department to attempt planned economy with its bureaucratic controls and regulations on a global scale.

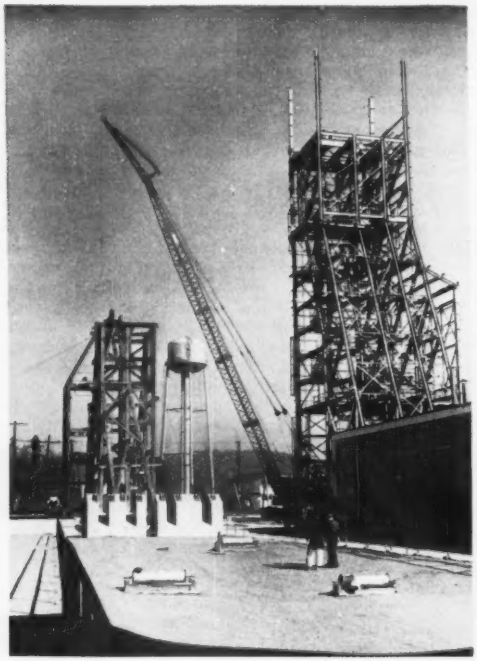
History records the difficulties of attempting market manipulation in international trade. Such efforts at stabilization through governmental monopoly control of the unstable world we live in usually end in failure. Perhaps some all-wise government in time may be able to control a competitive world and, by planning the economy, end the struggle for survival, but that Utopia seems as far away as it did 3,000 years ago. Mankind still must work to have economic security, and has to make use of that ingenuity the commission referred to before it became intrigued with ideas of government-managed economy.

Industry believes that private international investment on a large scale is the sound course to follow for the development of the natural resources of under-developed countries. The efforts of a free and resourceful people are likely to prove more effective than government bureaus. Government activities give rise to difficulties such as charges by other nations of United States monopoly control of world raw materials, imperialism, and the destruction of individual enterprise, all dangerous to the cause of a more peaceful world.

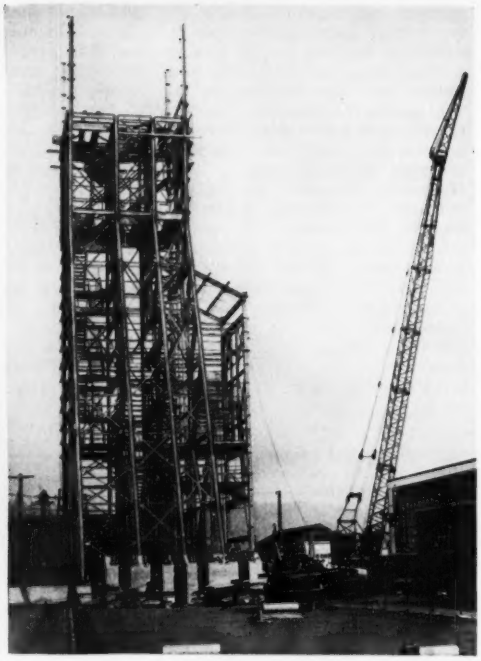
Global Ambitions

The commission would have Washington officials, already bewildered with the administration of a government grown too big for their management capabilities, extend their activities to a global scale. It might be better to leave to industry and private initiative the things that require the ingenuity, knowledge and the training of industry, and confine the activities of government to the service and protection of its citizens.

The editors have available a listing of these proposals, together with the PMPC's analysis of the outlook for specific minerals or metals. To obtain a copy, simply address your request to: The Editor, Engineering and Mining Journal, 330 West 42d St., New York 36, N. Y. For the complete report write to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price is $6.25 for all five volumes, or $4.50 for Volumes I, II, and IV, in which you'll be most interested.

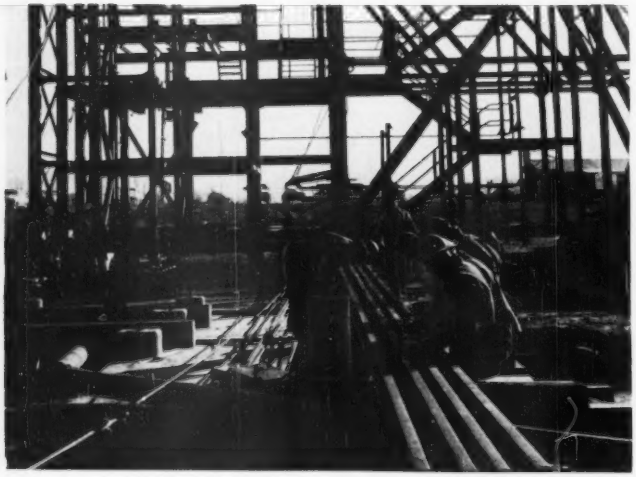


TEMPORARY WOODEN HEADFRAME, at left, has to be removed before permanent steel structure, erected on temporary site at right, can be shifted into final position.



PERMANENT HEADFRAME in position over shaft after being moved 67 ft. View taken looking along hoisting-rope run. Note turn sheaves at foot of backstay.

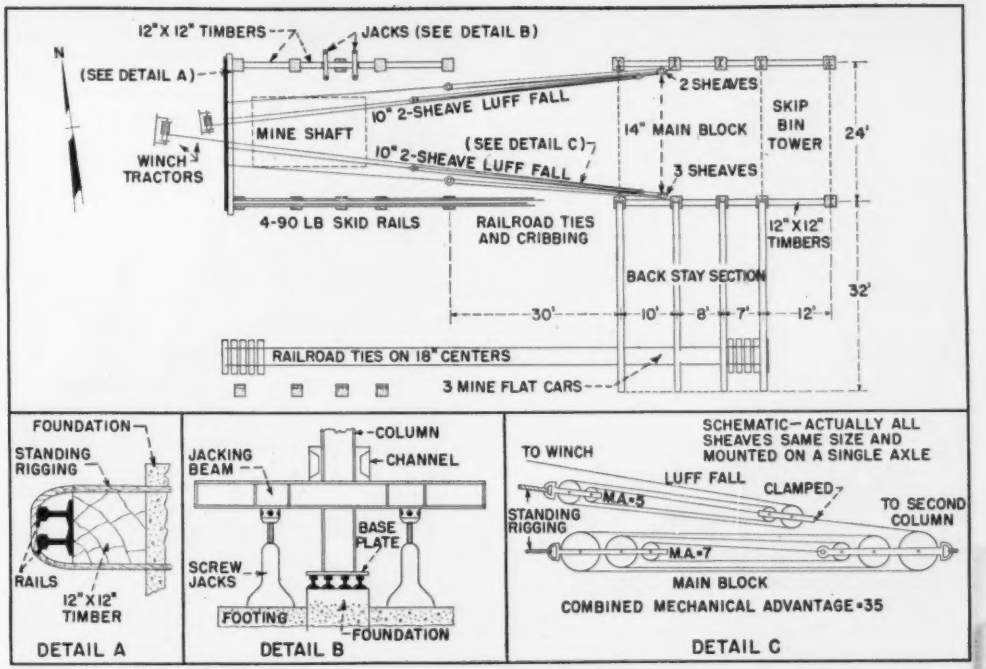
200-Ton Pre-built Headframe



FOUR 90-LB. SKID RAILS, here being greased, were placed on each foundation line under main structure columns. They held main weight during erection, and, when extended, permitted structure to be skidded to new position.

Structure shifted 67 ft. in three hours, 20 minutes at N. J. Zinc's new Friedensville mine.

OFFICIALS of the New Jersey Zinc Co., on Oct. 30, at Friedensville, Pa., witnessed the moving of the permanent steel headframe for the shaft of their new Friedensville zinc mine from the temporary erection site nearby to the position prepared for it over the shaft. The task was accomplished in three hours and 20 minutes by the Austin Co., engineers and builders of the surface facilities for the new mine. The headframe, 135 ft. high and 37 ft. wide, weighed 200 tons. Time required to move it over the 30 ft. between the two sites, a total distance of 67 ft., was three hours and 20 minutes. The rate of travel was 2½ ft. per minute.



PLAN OF SCHEME followed in moving permanent steel headframe from temporary erection site (above, at right) to operating position over shaft (at left, above). Note Detail B, for transfer from skid rails to permanent foundations, and Detail C for details of rigging. Compare plan view above with two pictures on opposite page.

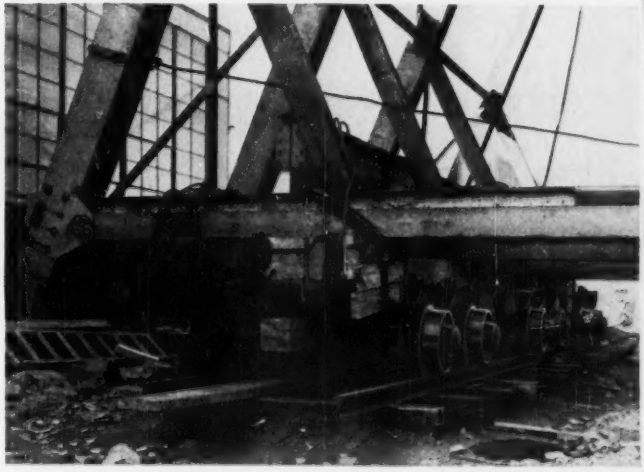
Moved into Position over Shaft

The shaft was out of service for only two days, this while the temporary headframe used in sinking was being removed and the new headframe substituted. Within a few hours after the moving was completed the shaft was ready for service again. Between four and five weeks were saved, counting normal working hours, in comparison with the time that would have been required to build the new headframe around the preliminary structure.

Few headframes[1] have been handled this way in the United States and this one is by far the largest.

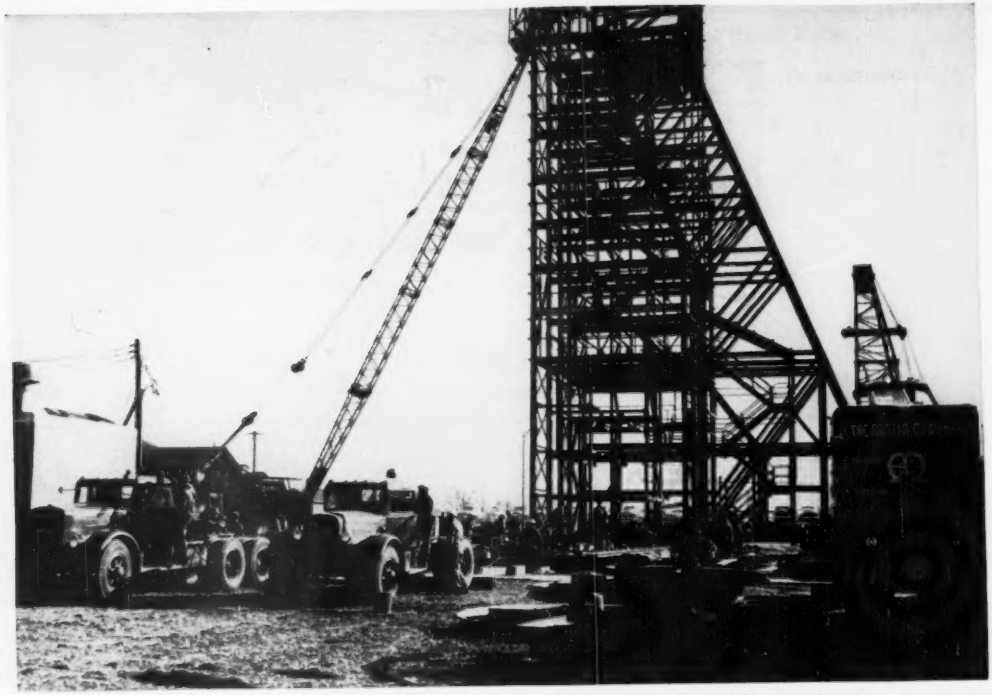
Plans Changed

The permanent headframe was designed to be built around the temporary one, but because of various changes in plans this method

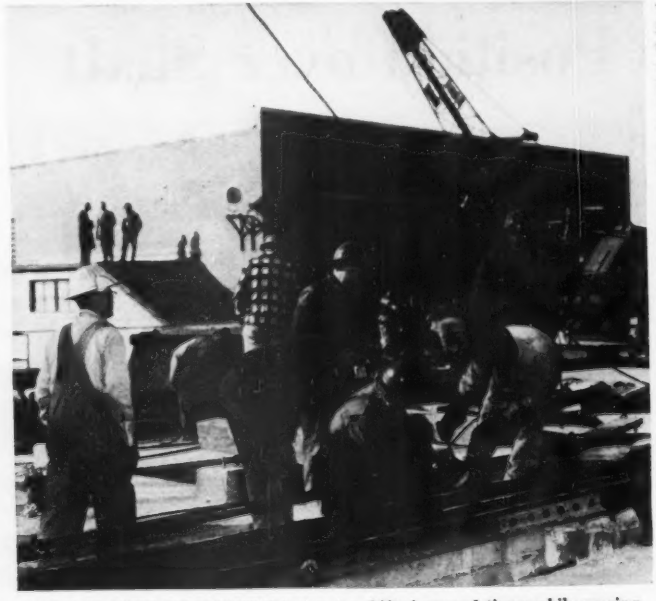


BACKSTAY SECTION of headframe was erected with inclined members supported at bottom by wooden cribbing and horizontal members resting on three flat mine cars, coupled together, which also supported them during moving.

[1] See also "How To Move a Headframe—and Why" *E&MJ*, May, 1952, pp. 78-81.



WHEN MOVING PERMANENT HEADFRAME, two winches mounted on truck tractors (left) pulled main load on polished and greased skid rails. Truck crane (right) pulled backstay section mounted on three coupled mine cars.



CABLE CLAMPS ON RIGGING had to be shifted several times while moving, as luff blocks came together. Method of timbering between foundation piers to distribute load can be seen. Note footmarks on nearest rail.

was abandoned to avoid interfering with mining operations. It was thought that minimum delay would be caused by erecting the headframe adjacent to the shaft. The idleness of the mine crew that would otherwise be created was one of the principal considerations.

A temporary foundation was built 30 ft. from the permanent location over the shaft. Four 90-lb. rails were placed on each of the two foundation lines under the main structure columns. These held the main weight of the headframe during erection, and, when extended at the west end, provided the skidding surface for its movement. These rails were polished and greased to reduce sliding friction.

The backstay section was erected with the inclined members supported at the bottom by wooden cribbing and the horizontal members resting on three coupled flat mine cars. During the moving, these cars traveled on industrial-gage track of 30-lb. rails with ties spaced 18 in. apart, center to center.

To keep the structure from spreading during movement, the

headframe was stiffened with steel struts welded to the 10-in., 49-lb. columns, diagonally tied with cable and steadied with guy wires. Steel stops were welded on each side at the bottoms of the base plates, parallel and close to the skid rails, to prevent side movement.

Because the headframe and foundation were not originally designed for being moved into place, the headframe had to be moved over the foundation at a height that would clear the anchor bolts and permit the structure to be centered over them. From this position, it was lowered onto the foundation by 30 screw jacks.

To insure against unequal settlement of the jacks, some of which would bear on the mine shaft foundation and some on the adjacent ground, concrete footings were formed adjacent to the foundation. Jacking beams were added to the columns so that four jacks could operate around each.

Initial rigging of the main two and three-sheave wire rope blocks and the luff tackle is shown in the line drawings on p. 77. Planned for a moving speed of no more than 6 in. per minute at the start, two low-speed winches mounted on truck tractors provided the skidding force.

To insure complete control over the forward progress of the headframe, the winch of a truck crane was connected to the backstay section. This winch was directly connected, because the pull was low, through one sheave fastened to the headframe.

Because of the high mechanical advantage of the luff tackle rigging, the luff falls were too-blocked several times. To aid in pulling them out for another move, a small air-powered tugger winch was mounted on the headframe in such a way that it could also be used to handle the flat cars, one of which had to be removed before the move was completed. The winch operated through snatch blocks located at strategic points.

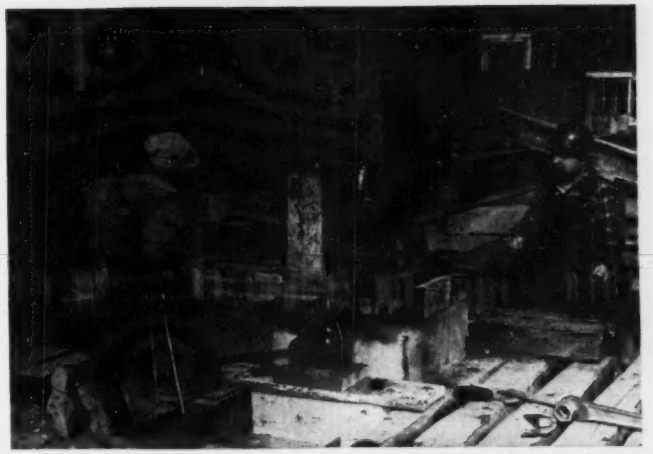
Freed From Rails

Since the headframe had been built up gradually on the skid rails over a period of time, the structure was stuck on the rails. To break it free, two railroad rails, one along each line of skid rails, were mounted on rollers to the east of the structure so they could be brought to bear on the headframe columns. With several men pushing each rail, the structure was freed on the first attempt. It then was on the grease and needed no further jarring.

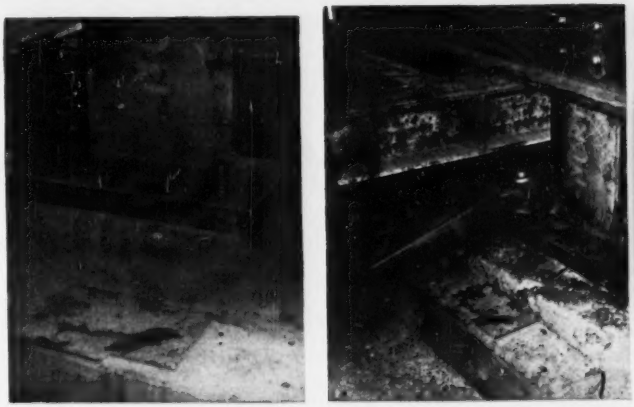
While the friction coefficients depended on amount and type of grease, and temperature, preparations were made for pulling the headframe with a force of 76,000 lb., using 0.2 as the friction coefficient. It was estimated that two-thirds of this force, or 51,000 lb. would be required at the center line of columns.

Movement of the headframe was easily controlled. It came to its final position over the shaft with all holes lined up with the anchor bolts. To insure completion of the jacking down in one day, the structure was kept on the rails overnight, to be lowered the following day.

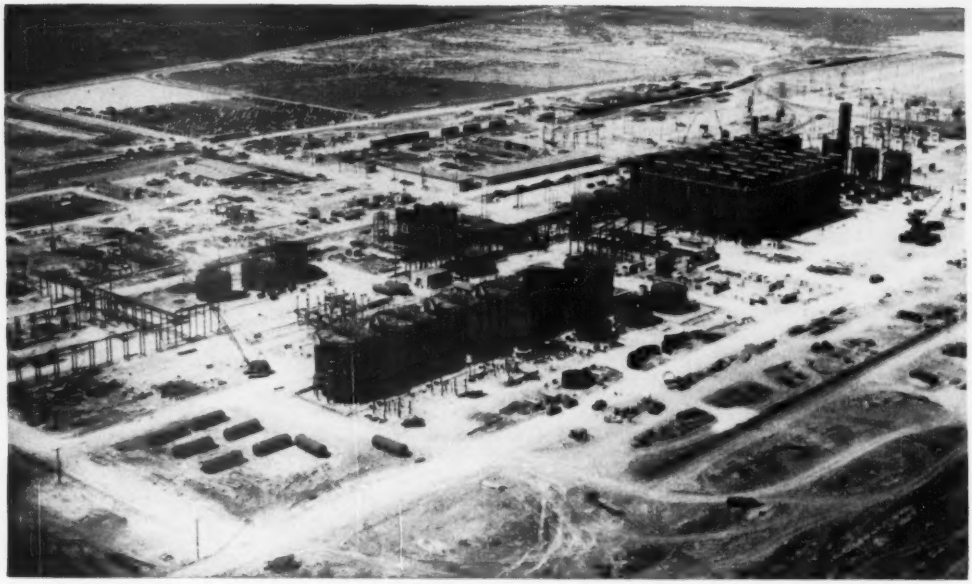
Main-lift pillow-block supports were placed on the headframe and ground turn-sheaves were installed prior to the move to reduce shaft outage after completion of the move. The headframe and accessory equipment have been designed for a total lift of 100,000 lb. (including ore skips, a combination of materials and man cage; counterweight, ore materials, men) from the bottom of the 1,260 ft. shaft.



IN POSITION OVER ANCHOR BOLTS permanent headframe is jacked up to permit removal of skid rails, and then jacked down to rest on foundation. Hardwood wedge seen under column, is used to permit accurate positioning.



FIRMLY SEATED AFTER JACKING DOWN on permanent foundation (at left), this column of permanent headframe is now in final position and needs only to have the hexagonal nuts turned down to complete the job (at right).



ALUMINA PLANT at Corpus Christi will ultimately have a capacity of 2,000 tons. Equipment for half that capacity is now under construction and will probably be in operation early in 1953. Reynolds calls this plant "La Quinta."

Corpus Christi: From Bauxite

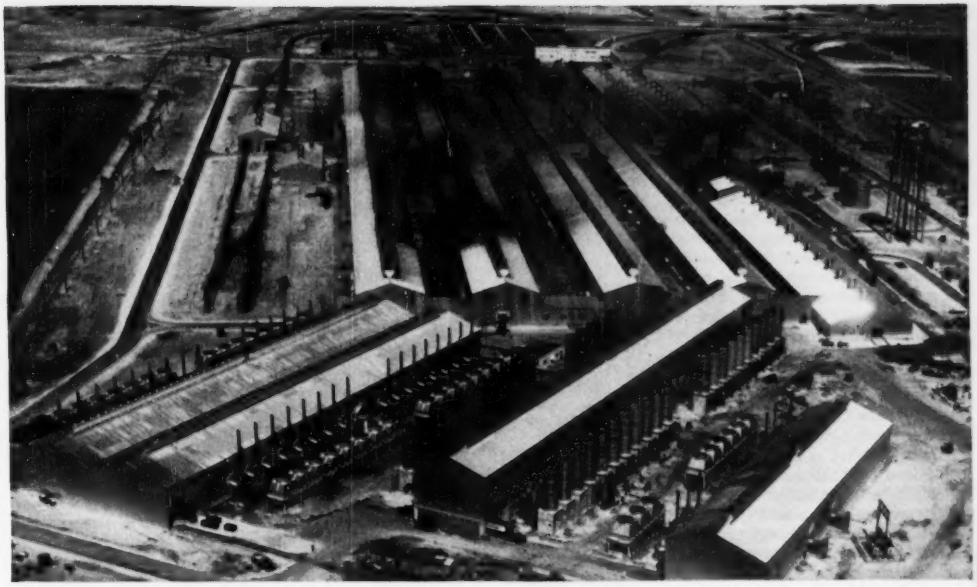
JAMES A. LEE
McGraw-Hill, Houston, Texas

NEAR CORPUS CHRISTI, Tex., Reynolds Metals Co. has a unique aluminum operation. It is the only plant in the United States where bauxite ore is brought in by deep water transportation from the mines and processed to pig metal. The plant also differs from others in the aluminum industry in that there are innovations in both alumina and reduction units. These new features are the result of many years of research and development by the company's engineers.

Our story starts at Jamaica where Reynolds has acquired large holdings and extensive deposits of bauxite.

The ore is mined and processed inland. From there, it is trans-

BAUXITE to feed the Corpus Christi plant will come mainly from Jamaican mines like this. With properties in Haiti and Santo Domingo, Reynolds has bauxite reserves of 350-million tons in the West Indies.



REDUCTION PLANT (San Patricio) at Corpus Christi has the capacity to produce 160-million lb. of aluminum a year. The $80-million plant is equipped with the largest potlines in the aluminum industry.

to Alumina to Pig Metal

ported by a 6-mi. overhead bucket conveyor to shore facilities where there are storage silos, loading towers, and a 500-ft. pier inside the protected harbor at Ocho Rios on the island's north shore. The large power plant and ore treatment installation inland have been completed. The ore will be brought from Jamaica to the Corpus Christi plant in the SS "Carl Schmedeman" which was built for Reynolds Jamaica Mines, Ltd., and left Jamaica with its first cargo of bauxite Oct. 21. This first self-unloading ore carrier to be used in the aluminum industry was named after the late chief geologist of Reynolds. This ship will be able to unload 13,000 tons in eight hours and will transport 580,000 tons of bauxite per year. The self-unloading equipment installed in the ship consists of two conveyors running under the holds of the ship and up a boom reaching out over the stern, where ore will discharge at the rate of 1,400 tons per hour. A second ship, "The Dragon," was purchased and is in operation. It has a capacity of 7,000 tons.

Reynolds recently contracted for the dredging of a 10-mi. channel through Corpus Christi Bay to its docks at the La Quinta alumina plant for use by the ore boat. As the bauxite is unloaded it will be carried over an automatic sampling device, and then along to the top of the storage and blending building where it can be unloaded at any point. Blending of ores from both Jamaica and Haiti will be done in this building.

Alumina Plant

The alumina plant was laid out for an ultimate 2,000 tons capacity. At present, equipment for one-half that amount is under construction. It will be completed and put in operation in the spring of 1953. The plant was designed to withstand hurricane wind loads.

While several processes have been developed over the years to produce alumina (aluminum oxide) from bauxite, the Bayer process is used by the Reynolds plant as it is by most others in the industry. In a nutshell, the process consists of dissolving alumina from bauxite in caustic soda solution to form a sodium aluminate solution, settling and filtering to remove insoluble residue, precipitating the alumina as crystalline aluminum hydrate from the solution, and calcining the hydrated alumina to aluminum oxide in kilns.

In the first step the bauxite ore, aluminum hydrate and impurities, will be wet ground in rod mills. Wet grinding of the ore will be used in this plant for it simplifies the operation, is cleaner and avoids the handling of wet clay which is troublesome. Grinding will be done with return caustic liquor from the evaporators. Caustic soda will be used instead of the more generally used lime and soda ash. It will be obtained from a nearby producer.

Caustic soda concentrations, intermediate between American-European practices, will be used due to the nature of the bauxite in Haiti and Jamaica. Haitian ore is a mixture of monohydrate and trihydrate and appears to be intermediate in solubility between ore found in North and South America and that found in Europe. Jamaica bauxite contains less monohydrate and more trihydrate than Haitian material,

and there are some orebodies in Jamaica that are almost entirely trihydrate.

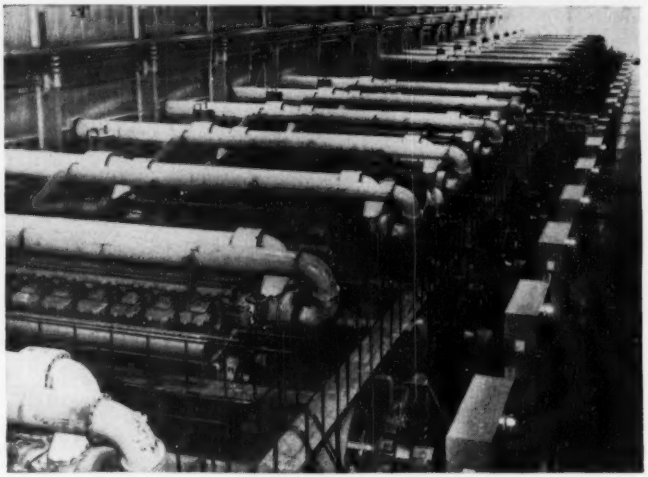
The mixture of ground ore and caustic will go to a slurry tank where it will be further fortified with caustic liquor. It will be pumped into the vertical digesters, treated with live steam and stirred to retain the solids in suspension. Digester detension will provide for conversion into sodium aluminate, water, and various other undissolved impurities which will be removed by settling and filtering to obtain a pure sodium aluminate solution.

Cooled and clarified strong aluminate liquor will be treated in a battery of high straight-side precipitation tanks similar to what is known in the mining industry as "pachuca tanks." To this liquor will be added fine aluminum hydrate from the seed tanks. The contents of the precipitation tanks will then be agitated with compressed air for a period of 24 to 30 hours, during which time the alumina is precipitated. The largest particles of the aluminum hydrate precipitate will be removed from the bottom of the tanks, washed, filtered and sent to dehydrating kilns. The gas-fired, rotary kilns will calcine the material resulting in aluminum oxide or alumina. This material will be conveyed to a 6,000-ton silo above the railroad tracks for storage. Since the output of the La Quinta alumina plant will be more than enough to meet the requirements of the adjacent San Patricio reduction plant, some of it will be shipped to the company's reduction plants at other locations.

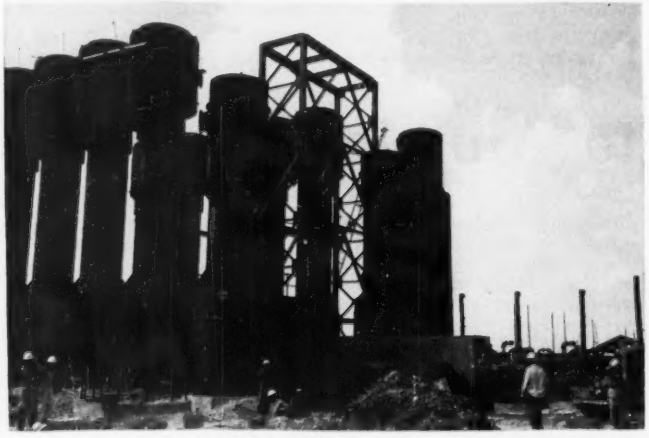
Designers of this alumina plant have gone farther than designers of similar plants in putting equipment outdoors. Precipitators, digesters, flash tanks and evaporators will be exposed to the weather. To do away with the building, self-supporting evaporators are being installed. These evaporators are new to the aluminum industry. They will be the integral type of six effects. Boilers will be outdoors but the turbogenerators will be inside the power house.

Reduction Plant

On April 24, 1952 Reynolds San Patricio reduction plant adjacent to the alumina plant commenced production. The plant has the capacity to produce 160-million lb. of aluminum a year. It was built at a cost said to be $80-million. The second of the plant's two potlines produced its first metal early in October.



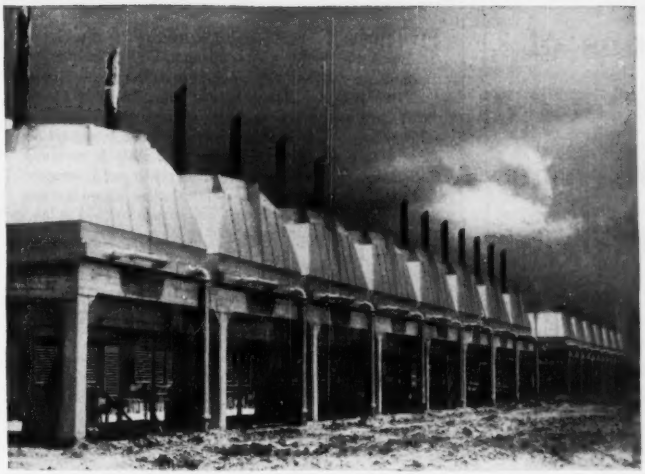
83 GAS-DIESEL ENGINES consume 50-million cu. ft. of natural gas a day to generate 175,000 kw. for reduction plant. Diesel fuel is used in emergencies.



SELF-SUPPORTING EVAPORATORS, integral type of six effects, are new to aluminum industry. No building will be needed for evaporators.

Briefly, the process consists of feeding (aluminum oxide) continuously into an electrolytic cell. (The cell is lined with carbon which serves as the cathode. Suspended into the cell is a carbon anode.) Alumina is dissolved by molten cryolite. Electrolytic action separates the aluminum from the oxygen in the alumina, which passes off as carbon dioxide. The metallic aluminum accumulates at the bottom of the cell, from which point it is periodically drawn off and cast into pigs.

Alumina will be transported from the adjacent La Quinta plant, when that plant is completed, in special hopper bottom railroad cars. Meanwhile, the alumina is obtained from the company's plant at Hurricane Creek, Ark. Carbon paste for the linings for the potline cells and the anodes is made in a separate building at the reduction plant. The raw materials are petroleum coke, beehive coke or anthracite and pitch. Power for the electrolytic process and other operating purposes is supplied by 83 gas diesel engines. The power plant has the capacity to generate 175,000 kw.



BATTERY OF RADIATORS dissipates heat developed by gas-fueled diesel engines (photo at left). Equipment cools lubricating oil as well as water.

Reynolds has installed at San Patricio the largest potlines in the aluminum industry. The size of the pot has much to do with the power efficiency of the reduction operation (the number of kilowatt hours required to produce a pound of the metal). Approximately 10 kwh of electricity to the pound of metal produced is generally recognized in the industry as representing the efficiency of the reduction operation. The large pots result in conservation of heat that appears to make possible important economies reducing the number of kilowatt-hours of electricity required to produce each pound of metal.

Furthermore, Reynolds has found that the larger pot contributes considerably to more uniform pot operation. The larger working area of the Soderberg anode used in the San Patricio reduction plant (four times as large as the ones at the company's Listerhill, Ala., plant) assures much steadier operation at the point of maximum efficiency. This in turn contributes to higher overall average efficiency, which is the important figure in the eyes of aluminum producers.

To obtain the least possible length of bus bars with the lowest possible power loss, the four pot rooms, each 1,580 ft. long, are arranged along side each other with the power plants at one end. A conventional pot operates at a voltage drop of 4.5 to 5.5 v., and direct current generators operate most efficiently at several hundred volts. Therefore, the pots are connected in series; 600 v. at 32,000 to 50,000 amps will handle the power requirements of a conventional potline.

Bus bars connect generators to the first pots in each building in a potline. Power is conducted from pot to pot in one building until it reaches the far end. Other bus bars then connect to the next building, where the current is conducted from pot to pot back until it reaches the end of the second building near the generator plant. In this way the current has made a complete circuit down one building and back up the length of the other. In this way two rooms are used to make a single potline. There are two lines in this plant. This typical layout has several advantages. Total bus bar requirements are kept at a minimum. There is no great electric potential between adjacent cells. Since there is only a 5-6 v. drop per cell and all cells insulated from ground, there is a minimum hazard to the operators.

When a cell is in operation, the current passes through the bath and breaks down the alumina dissolved in the cryolite. The metal accumulates at the bottom of the pot in molten state since the pot temperature is about 1,800 deg. F., considerably above the melting point of aluminum. The metal is permitted to accumulate until there is a 5-in. layer on the bottom. At this point 1 in. is removed by syphoning out some of the metal. The daily output of the two potlines is about 440,000 lb. A vacuum crucible drains the pots. It is a large sealed vessel with a heavy cast iron pipe connected to the top and shaped so it will reach down into the layer of metal in the bottom of the pot.

Every piece of equipment is carefully preheated with gas torches before it is brought into contact with the molten aluminum to prevent explosions due to trapped moisture.

The vacuum crucibles carry a 6,000-lb. load of molten metal. They are handled from the pots to the center passage of the pot rooms by overhead electric cranes. There are two 30-ton cranes in each pot room. Each crane carries two 15-ton hoists.

By means of the cranes, crucibles can be deposited on small flatcars which travel over a narrow-gage railway into the metal service building where another crane takes over. Here the metal can be cast immediately or sent to one of the holding furnaces. These include two 60,000 lb. capacity units, and one that can hold 120,000 lb.

Aluminum can be cast into any one of three direct-chill casting machines, into one of four pouring wheels making 50-lb. pigs, or into stationary pig molds making up to 1,000-lb. pigs. Equipment is also available to make special ingots weighing from 1 to 10,000 lb. each.

The metal can be fluxed, skimmed and dressed in the holding furnaces. Also it can be mixed with alloying elements to make various alloys as desired. The ingots are shipped to the company's rolling mills at which are Listerhill, Ala., and McCook, Ill.

The power plant that generates electricity for the electrochemical reduction process consists of 83 gas-diesel engines. It has the capacity to generate 175,000 kilowatts and consumes 50-million cu. ft. of natural gas a day. There are 33 Cooper-Bessemer and 41 General Motors engines. The former are 16 cylinder horizontal units; the latter are 16-cylinder four-bank vertical radial engines.

Lube Oil Reclaimed

Handling and reconditioning engine lube oil and air filter oil is a major undertaking in this large electric power operation. Much of the oil is reclaimed in a special section of the plant and returned to the respective equipment for reuse. Periodic determination of the cleanliness and viscosity indicate that the quality of reclaimed oil about equals that of fresh oil.

Can Cross Sections of Mountain Ranges Be Used As Guides To Discover New Mineralized Areas?

Three thought-provoking principles set forth here by Mr. Reinhardt should be an excellent stimulus to interest in structural geology as a guide to finding ore. — *The Editors.*

Principle 1. If the uplift is narrow; if the dip of the sedimentary strata on its flank is steep; and if, at specified distances from the crest, the same formation lies at equal elevations on opposite sides of the uplift, the major ore deposits will be found only at or very near the crest. The reason: the inverted V-shaped roof of the underlying batholith is so steep that any irregularities in its roof will open upward and will not act as traps for volatiles rising in the magma.

Example: Idealized cross section of a narrow, steep-walled, symmetrical mountain range or dome. Irregularities on the roof of the igneous core are not closed and cannot become traps for volatiles rising in the magma.

ELMER V. REINHARDT
Grand Junction, Colo.

A STUDY of mineralized areas in relation to curved and junctioned mountain ranges,[1] has shown that ore deposits, although in the vicinity of the curves and junctions, seldom coincide with them exactly. Some lie in the acute angle of the curves; others lie in the outer or obtuse angle. At the junctions, some of the mineralized areas are found to lie on the opposite flank of the range from the side on which the junction occurs. Ore deposits generally are found on the flanks of mountain ranges, not on the crests.

Similarly, in domical structures, mineralized areas are seldom found at the apexes. They usually occur on the slopes.

After several years of study by the author, the explanation of these phenomena appears to have been found in the relative dips of the strata bounding the mountain ranges on the opposite sides. The mineralized areas are found on the side of lesser dip; to express it in another way, mineralized areas are found on the side of a mountain range where a chosen sedimentary formation lies at greater elevation.

Three principles have been devised which should apply to major hydrothermally mineralized areas of the world. They definitely do not apply to many small, isolated deposits. These principles apply both to domes and elongated mountain ranges.

They are based upon a rule first stated by B. S. Butler . . . that most of the hydrothermally mineralized areas of the world are grouped around stocks which erosion either has not exposed or has truncated near their apexes, leaving them of small areal extent at the surface. An apparent explanation for Butler's generally accepted rule is as follows: The metallic constituents of a magma volatilize at lower temperatures than the silica and silicates which form the main mass of the magma, and, as volatiles, float to the top of the magma chamber, seeking the highest points or stocks projecting above the main roof of the batholith. There, they concentrate under great pressure which is relieved only by their escape, vertically and laterally, into fractures extending outward from the stock. As the volatiles rise in the fractures, they mingle with ground waters and become hydrothermal solutions propelled by the rising volatiles below. Visualized in this manner, there is a marked analogy between oil concentrations in closed structures floated into place on water and metallic concentrations floated into place as volatiles on molten magma. Similarly, also, the stock must have a closure just as an oil structure must be closed; for if one side of the stock opens upward, the volatiles will escape to a higher point on the roof of the magma chamber.

Three important guiding principles are stated and illustrated above. Note also idealized cross sections depicting type of mountain range described in each principle.

Symmetrical domes and mountain ranges like those described in principles 1 and 2 are rare; principle 3 covers by far the greatest number.

Most of the ores at apexes and crests have undoubtedly already been found since they lie in elevated regions not readily covered by later superficial deposits. It is reasonable to assume that most of the volatiles rising in a magma will reach the main crest or apex of a batholith. It follows, therefore, that the largest and richest orebodies were deposited in the crests or apexes. It is also true that these crests were subjected to the first, the heaviest, and the most continuous erosion. Many of the crestal ores were completely removed at an early date in the erosion cycle. Many others are now manifested by small, shallow deposits—roots of once major deposits.

With few exceptions, therefore, our present-day major deposits lie on the flanks of uplifts.

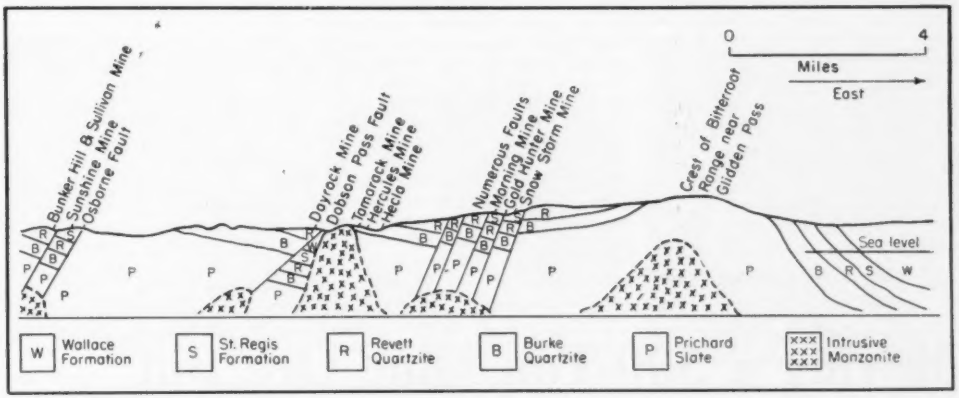
It is almost certain that many mineralized areas on the flanks of uplifts have not been found. They lie buried beneath talus slopes, outwash plains, recent lava flows, soil and vegetal debris and under sediments formed after their deposition; or they lie so deeply buried that they are manifested at the surface only by areas of rock alteration such as silicification or sericitization. In the previous paper cited, it has been indicated that the proper places to look for these hidden deposits is in domes and near the curves and junctions in mountain ranges. When the uplifts

Principle 2. If the uplift is broad with gently sloping strata lying at equal elevations on both flanks, mineralized areas may be found at the crest as well as on both flanks. The reason: irregularities in the gently sloping roofs of the underlying batholith form local enclosures or traps for rising volatiles in the magma. The volatiles rise to the top and become trapped until they find a fissure or other plane of weakness through which they may escape to cooler areas where they form ore deposits.

Example: Idealized cross section of a broad, low, symmetrical mountain range or dome. Irregularities on the roof of the igneous core are closed and act as trap for volatiles rising in the magma.

Principle 3. If the uplift is gently sloping on one side and steeply sloping on the other, then mineralized areas will be found from the crest down the flank of lesser dip. The reason: the steep side will not form closed stocks. Any irregularity in the roof on the gently sloping side will act as a trap for rising volatiles.

Illustration: Idealized cross section of a mountain range or dome that is steep on one side and gently sloping on the opposite side. Note the closed stock only on the side of lesser dip.



Examples Illustrating Principle 3.

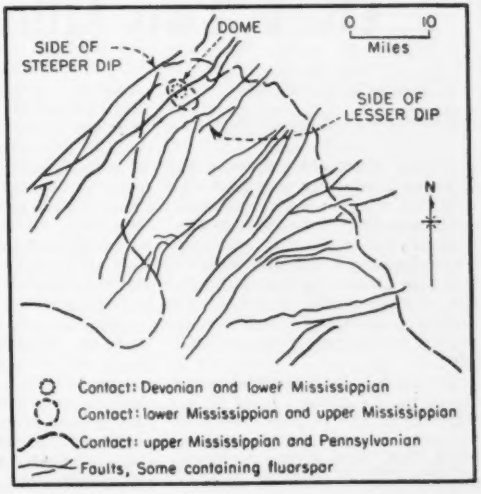
1. Generalized section above, looking north through the Coeur d'Alene mining district. The portion of the section west of the crest was prepared from the geological map accompanying F. L. Ransome's USGS Professional Paper 62. The portion of the section east of the crest was prepared from personal observation.

On the eastern side—the side of greater dip—there are no productive deposits. At the crest, the Revett and Burke quartzites, which are favorable to ore deposition, have been removed by erosion. Some low-grade ores have been found in the underlying unfavorable Pritchard slate.

West of the crest, on the side of gentle dip, lie the great mines of the Coeur d'Alene district.

2. Geologic map of Hicks Dome in the Illinois-Kentucky fluorspar fields. Copied from L. W. Currier, USGS Bulletin 886 B, at right.

Most of the fluorspar veins lie on the southeastern side of the dome—the side of lesser dip. The results of mineralization continue in this direction for 40 mi. The two veins on the northwestern side of the dome are closed to the apex. This is the side of greater dip.



are not symmetrical, and they usually are not, the search should be directed to the sides of lesser dip or greater elevation of a specified formation.

In addition to the two accompanying sketches, there follows a brief description of a few of the many mineralized areas in which the principles given above have been found to apply:

1. Leadville-Alma, Colorado: The two districts are separated by the Mosquito Range formed by gently easterly dipping strata broken by a series of faults in such a way that the Leadville limestone on the west or Leadville side of the range is at the same elevation as on the east or Alma side. In the area underlying the range between the two districts, however, it is at a somewhat higher elevation than on either flank. Thus, the range is a broad, low symmetrical uplift. Intermittent mineralized areas extend from Leadville across the range to Alma. (Principle 2).[2]

2. Park City, Utah: Strata dipping gently to the east are broken by large normal faults creating a difference of thousands of feet in elevation of the same formation (the Wasatch Mountains). Park City lies east of the faults on the side of greater elevation. (Principle 3.)[3]

3. In the Andes Mountains, from Ecuador to Bolivia, all the major mineralized areas lie near or east of the crest. This portion of the Andes Mountains is a large asymmetric fold rising gently from the east in a series of anticlines which increase in height as the crest is approached. West of the crest, the strata dip steeply down to sea level. (Principle 3.)[4]

4. The silver veins at Rosario, Honduras, lie in and near a complex igneous plug which outcrops at the apex of an asymmetric dome. The strata on the flanks of the dome dip gently toward the south and steeply toward the north. The plug, however, crosscuts the strata and dips steeply to the south. The original discoveries at surface lie on both sides of the eastern and northeastern contacts of the plug. These deposits became impoverished at about 800 ft. of depth. Exploration to the south, however, disclosed other veins containing ores which did not reach surface. At present, 2,600 ft. below the surface, all known ores at that depth are being mined from the sedimentary formations on the southern side of the plug several thousand feet south of the original discoveries. This southerly plunge of the ore indicates that the source or parent stock has not yet been discovered in the mine openings and lies south of the apex of the dome on the side of gentle dip. (Principle 3.)[5]

The three principles given above have been applied to more than thirty major mineralized areas without failure.

Most of the literature on mineralized areas is so closely confined to the immediate area of production that it is difficult to obtain the regional information needed in this study. The author would be glad to hear from any readers who find these principles applicable to areas with which they are familiar.

In conclusion, I wish to acknowledge the kind assistance of Chas. H. Behre, Jr., professor of geology, Columbia University, who has reviewed an original draft of this article, and offered much-appreciated constructive criticism.

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[1] Reinhardt, Elmer V., "Can a Study of Topography Locate Undiscovered Mineralized Areas?," *E&MJ*, September, 1949, pp. 90-93.

[2] Emmons, S. F., Irving, J. D., Loughlin, G. F.: "Geology and Ore Deposits of the Leadville Mining District," 1927, U. S. Geol. Survey, Prof. Paper 148, Summary p. XIV.

[3] Gilbert, G. K.: "Studies of Basin and Range Structures," 1928, U. S. Geol. Survey, Prof. Paper 153, p. 62. Also, Boutwell, J. M.: "Geology and Ore Deposits of the Park City District, Utah," U. S. Geol. Survey, Prof. Paper 77, p. 14.

[4] Observations made by the author on three reconnaissance trips across the Peruvian Andes 1936-1942.

[5] Studies made by the author from January to September, 1947.

Moving a 500-Ton Mine Ore Bin Over Two Miles of Rough Terrain

ROBERT K. YOUNG

Project Engineer, Foley Brothers, Inc.

MOVING A STEEL ORE BIN weighing 500 tons 2 mi. over rough terrain from the Monitor shaft to Kennecott's new Deep Ruth shaft in Nevada was one of the more spectacular engineering accomplishments at this new project. [1]Foley Brothers, Inc., of Pleasantville, contractor for surface construction and underground development work did the job.

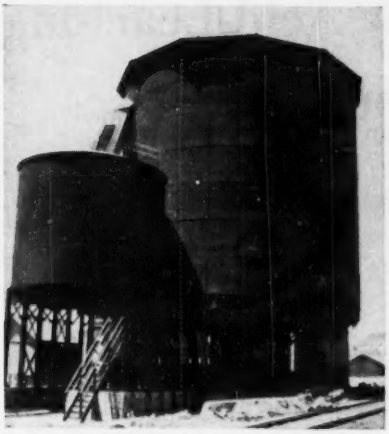
The ore bin, used to store copper ore at the headframe, is 54 ft. in diameter and 67 ft. high. Ore was loaded into railroad cars from two tracks beneath the bin. Four rows of 15 ft. 4-in. steel columns supported the bin. Two exterior rows contain 10 columns each, and two interior rows, 14 columns each. These columns rested on concrete foundations and tied into 28-in. I-beams supporting the bin floor. The huge weight of the ore bin is partly due to 60-lb. vertical rails which line the bin.

Before moving the bin, a smaller waste bin adjacent to the ore bin was moved. This bin is 26 ft. in diameter by 23 ft. high, weighing about 50 tons. It was jacked down onto a low-bed truck. During the road haul, a D-8 Caterpillar tractor was used behind the truck to prevent possible back-sliding on steep upgrades encountered in the move.

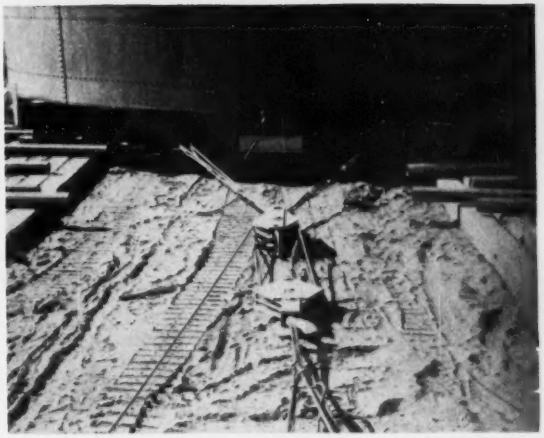
For the larger ore bin, six solid cribs of railroad ties were built under the bin; two along the outside of each exterior column line, and one at each end of the interior column lines. Jacks were placed under the I-beams, and the bin raised until the bottom of the colums cleared the anchor bolts. The columns were then cut loose, and removed. Next the bin was lowered 12 ft. in an operation employing 12 100-ton jacks.

Preparations for actual moving were as follows: Fifty-seven 30-ft. lengths of 12x16-in. timber were obtained for building tracks ahead of the bin. These were later supplemented with about an equal footage of 12x12-in. timbers because

[1] See "New Copper Projects in Nevada Will Open More Ore for Kennecott" by J. B. Huttl, *E&MJ* Oct. 1952, pp. 92, 93

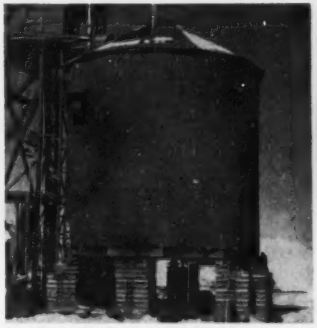


LARGE ORE BIN weighing 500 tons and small waste bin weighing 50 tons were lowered and moved 2 mi. to new site.



CLOSE-UP VIEW of moving gear shows tracks consisting of 12x16-in. timbers, rollers made of 8-in. well casing filled with concrete, and 1½-in. cable.

ON 9% GRADE, two Caterpillar tractors were needed to pull, and two to push. One tractor was dug in with a ripper behind to serve as a dead man.



AFTER RIGOROUS HAUL, ore bin is being jacked in place at Ruth shaft.

of raveling of the timbers. One-hundred rollers varying from 7 to 10 ft. were made by filling 8-in. dia. well-casing with concrete. Wall thickness was ⅜-in.

Moving then proceeded as follows: Two tracks consisting of four 12x16-in. timbers laid side by side were constructed ahead of the bin. The rollers were laid out on these tracks ahead of the bin and were fed in between the timbers and the I-beams as it was pulled ahead. Timbers and rollers moved from behind to ahead of the bin by a 6x6 winch truck.

For the first move of about 100 ft., timbers were placed between the rollers and the I-beams, since that move was made perpendicular to the direction of the I-beams. After this first move, the bin was jacked clear of the timbers, and the top layer of timbers was removed. Bottom timbers were turned parallel to the I-beams. Finally the bin was lowered directly onto the rollers for the major part of the move.

For moving the bin on the level, a four-part line of 1½-in. cable on a D-8 tractor with another D-8 tractor dug in as a tail-hold was sufficient. For grades up to 2% a six-part line was used. Grades up to 9% were encountered. These required a tractor dug in with a ripper behind for a dead man, two tractors pushing the bin, and two pulling on a six-part line. The tractors behind were used primarily to prevent backward roll in case of a cable break. Curves were negotiated by angling the rollers.

Roughness of the terrain necessitated much road building. About 1 mi. of road, 60 ft. wide had to be carved out of waste dumps. Two tractors were kept busy building road ahead of the bin between moves. A cut 40 ft. deep, 70 ft. wide, and 100 ft. long was made through a neck of land leading to one of the waste dumps. It was originally planned to route the bin around this dump along a relatively flat 3½-mi. haul. But when it was discovered that the bin could be handled on steep grades the new route was selected.

Turning and moving operations performed at the start of the move had to be repeated to bring the bin to proper position on its foundations at the Ruth shaft site. Cribs were built under the bin to raise it with jacks, in the same manner as performed during initial lowering operations. Four and one-half months were required to complete the entire lowering, moving, and raising operations. L. J. Bares is project manager of Foley Bros., and Bent H. Greve, superintendent in charge of moving the bin.

New Acid-Leaching Section Raises Cyprus Copper Recovery by 10%

A. W. SCHLECHTEN
School of Mines and Metallurgy, Rolla, Mo.
J. L. BRUCE
Cyprus Mines Corp., Los Angeles, Calif.

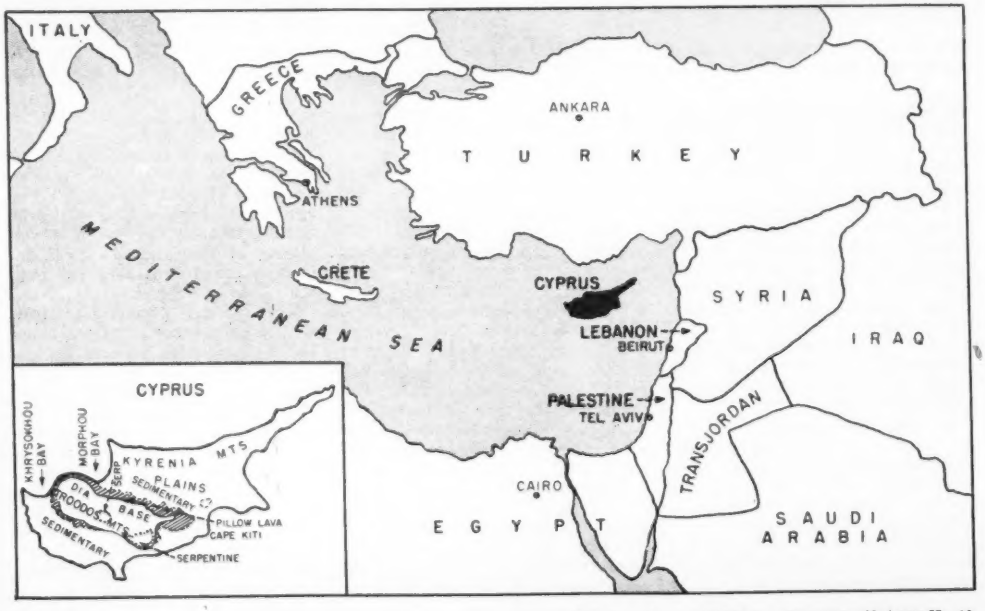
WOMANPOWER helps mine Cyprus copper. Pyritic orebodies are confined to pillow lavas, shaded on map below.

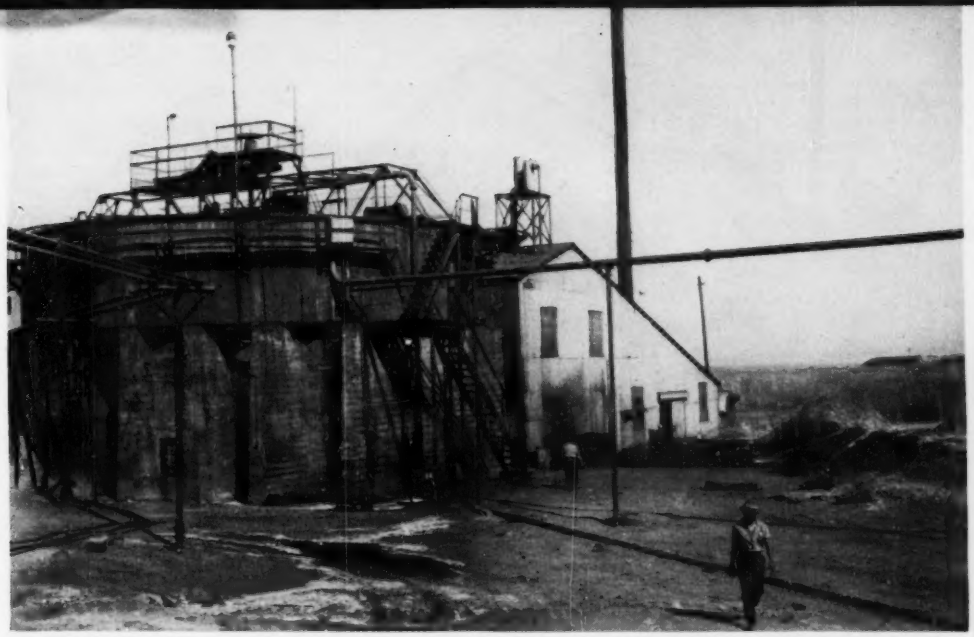
CYPRUS MINES CORP. has been producing cupreous pyrites products from Cyprus since 1922 with the exception of the period from June, 1940, to May, 1946, when the war intervened.

Early shipments of crushed and sized ore running about 2.25% Cu and 48% S, were made from the Skouriotissa mine. This ore was not amenable to concentration because of the high water-soluble content.

At the Mavrovouni mine, the large orebody is similar to Skouriotissa except that it contains about

Background information on Mavrovouni mine abstracted from Mr. Bruce's Technical Publication No. 2459 of the AIME.





THICKENER receives a 20% copper concentrate from the flotation plant and its spigot product is sent to the filtering plant (behind thickener) where Oliver filter dries concentrate to about 12% moisture.

4.25% Cu. Sulphur content is about 48%. Copper content of this ore is too high for a desirable feed for acid-works roasters, although a limited quantity could be sold for upgrading purposes.

Because of these limitations, and because Skouriotissa was in a position to supply most, if not all of the cupreous pyrites market, Cyprus Mines' engineers decided to install a concentrator to separate, as much as practical, copper minerals from iron pyrites of the Mavrovouni ore. Some of the pyrites in the tailings would be marketed currently. The remainder would be stockpiled. The first 25-tons-per-hour unit was placed in operation in 1934.

In July, 1949, Cyprus Mines Corp. decided to investigate the possibility of acid leaching their pyritic Mavrovouni ore, to recover basic copper sulphates not soluble in water and which were nonrecoverable in the existing flotation plant.

After extensive investigation, metallurgists decided to remove this acid soluble basic copper sulphate prior to flotation, rather than subsequent to flotation. The Dorr Co. was engaged as consulting engineer to determine the feasibility and requirements for the project.

Laboratory investigations and assembly of preliminary design data was completed and the decision was made in April, 1950, to proceed with design and construction of the plant. Construction was started in Cyprus, June 1, 1950.

The process consists of leaching 2,000 long tons per 24 hours of minus ½ in. raw Mavrovouni ore with 4% sulphuric acid containing 2 gm. per liter ferric iron, separating the leached material into sand and slime portions, washing the sand portion in four counter-current classifiers, and the slime in four countercurrent thickeners.

The combined washed sand and slime goes to the existing grinding and flotation plant, and the pregnant solution to iron cementation for recovery of the dissolved copper.

New Acid Plant

In order to provide the weak sulphuric acid for leaching, it was decided to construct an acid plant at Cyprus. After investigating all applicable types of sulphuric acid plants, since strong acid was not required, the Keyes' Autoxidation Process was selected as the most suitable.

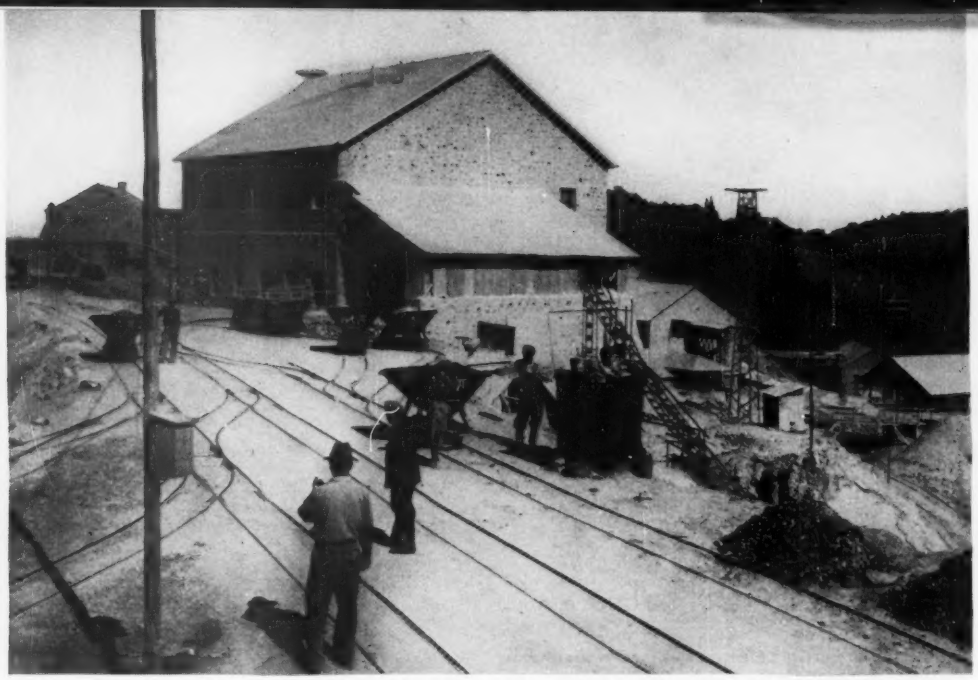
To obtain design data, a pilot plant was operated on the Keyes Process at Phoenix, Ariz., producing 1 ton per day H_2SO_4 (100% basis) at 5, 7½, and 10% strengths.

The acid plant consists of a 21-ft. 4-in. diameter 12-hearth Pacific Foundry roasting furnace for producing 7.5% SO_2 gas from Cyprus pyrite. The gas is cleaned in British Buell International cyclones, and the temperature adjusted in automatically damper-controlled gooseneck standpipes. The gas is then further cooled and washed in spray towers before it is compressed with Sutorbilt stainless steel cycloidal blowers and sent to the Keyes acid-cell distributing pipes. Air for the acid cells is supplied by Nash rotary compressors through "Aerox" porous silica tubes. Ferrous iron is used as a catalyst in the ratio of 1 gm. per liter iron to 20 gm. per liter acid produced.

A feature of the plant is the use of safety absorption towers packed with Berl saddles to prevent atmospheric pollution by the SO_2 gas. The entire acid-making system is under slight vacuum and all exhaust gas must pass through the absorption towers.

The leaching plant itself consists of two 7-ft.-6-in. diameter by 16-ft.-long Mine and Smelter Supply Co. rubber-lined leaching drums, further lined with fused cast basalt blocks to take the wear from the coarse pyrite ore. The leaching cycle is 10 minutes maximum.

The sand-slimes separation is made in a 7-ft.-wide Type HX Dorr classifier; all underwater parts, in-



ASBESTOS is also mined on Cyprus by the Cyprus Asbestos Mines, Ltd. This milling plant separates asbestos from crude ore with a ratio of concentration of approximately 100:1. Mine is at 4500-ft. elevation on Mt. Freedos.

cluding the tank, are constructed entirely of No. 316 stainless steel. Bolted construction is used throughout on the stainless steel. A separation at approximately 100 mesh is made in the first classifier and the classifier rake product subsequently goes to three more identical classifiers arranged in countercurrent for washing the granular portion of the ore.

The classifier overflow goes to a series of four Dorr centerpier torque thickeners in CCD for countercurrent washing of the slimes and recovery of the pregnant copper solution.

These thickener mechanisms are constructed entirely of bolted No. 316 stainless steel for all underwater parts and the thickener tanks themselves are heavily reinforced concrete, lined with laminated asphalt and Fibreglas layers.

Six-inch, Type W Dorrco diaphragm pumps, also constructed of cast and bolted No. 316 stainless steel, are used for underflowing the thickened slimes.

The cementation plant has been patterned very closely after the new Inspiration Consolidated plant at Inspiration, Ariz. It consists of eight double troughs, each 20 ft. x 60 ft., which are charged with shredded iron and will be operated according to the Inspiration cycle.

A 70-ft. British Irving gantry crane spans the cementation launders and is equipped with a 65-in. lifting magnet and a 1½-cu.-yd. clamshell bucket for charging the shredded iron and removing the cement copper. Cement copper is cleaned by passing it through an Inspiration-type trommel screen, 4 ft. diameter by 12 ft. long with 5/16-in. plate perforations, fabricated by J. F. Poole, Ltd., in England.

Plant Innovations

Novel features of the plant consist in the lining of all concrete tanks with Wailes-Dove Bituplastic and Fibreglas laminated coatings; the use of lead fittings and lead-lined Saunder's valves almost exclusively. Other features are the use of wood sump tanks, launders, and pump boxes with lead connections; completely rubber-lined British International combustion Vacseal centrifugal pumps throughout, except for the thickener underflow diaphragm pumps. All SO_2 gas piping is in lead or lead-lined steel ducts and the only stainless steel employed in the entire acid-making plant will be the Sutorbilt blowers which are fabricated of solid cast and machined alloy 20 stainless steel.

Fairly elaborate instrumentation is provided in the acid plant for operating control. In this connection, British "Integra" Leeds & Northrup instruments are used on all temperature, temperature control, SO_2 gas analysis and sulphuric acid strength measurements. British Lea V-notch recorders are used on all acid and solution flows. Draft gages, pressure gages, and orifice meters are British George Kent instruments.

Transite pipe is sparingly used and then only where the acid strengths are under .2%, such as for transfer of the pregnant copper solution from the leaching plant to the cementation plant about 2,500 ft. away, and for some large flow lines in the cementation plant.

Of interest are the heavily reinforced 120-ft.-diameter concrete thickener tanks. Located on poor ground, they are being poured entirely monolithic with no construction joints, by a novel rotating bridge, with no "cold" joints. The first tank was poured complete in 60 hours, the second after a 25-day preparation interval in 67 hours, the third after an 18-day preparation interval in 55 hours, and the fourth after a 19-day preparation interval in 48 hours.

It is anticipated that this acid leaching section to the Xero concentrator will result in an overall

increased copper recovery of about 10%.

This improvement in recovery is very much needed because the concentration of copper minerals in Mavrovouni ore is not without its difficulties. An average analysis would be:

Cu	4.2%
S	48.0%
Fe	43%
Zn	0.4%
Au	0.025 oz.
Ag	0.25 oz.

Concentration Problems

The following conditions all offer problems in concentrating:

1. Copper minerals in unoxidized ore include not only the primary mineral chalcopyrite, part of which is intimately associated with the pyrite and finely disseminated, but also bornite and covellite, part of which occurs as microscopically thin films on pyrite, and also "sooty" chalcocite, much of which is less than a few microns in diameter and difficult to float in a pyrite depressing circuit.

Part of the pyrite occurs in very fine crystals, a few microns or less in diameter.

Fine grinding will not free the copper minerals from the pyrite.

2. Upon exposure of the ore to the air by development galleries, and after breaking in stopes and galleries, sulphating occurs rapidly. This produces brochantite, a copper sulphate, which is not soluble in water and consequently cannot be extracted and removed from the ore by washing. It is practically inert and does not float well under sulphidizing conditions in alkaline circuit required for depression of the pyrite.

3. Very fine grinding is not economically practical because this reduces the amount of granular pyrites that can be removed as marketable pyrites product from the concentrator circuits.

Because of a tendency for the sulphative ores to cement and set, ores from the mine are stored in open-type bins without side walls. It is fed onto conveyors by pan feeders and goes to the crushing plant where a 10-in. gyratory and 42 x 16-in. rolls reduce the size to ½ in.

From a premill storage bin the ½ in. ore goes to the washing plant. An acid-proof Dorr classifier overflows much of the minus 100 mesh copper minerals and pyrites. Sands go to the grinding section where it is further reduced by four Hardinge ball mills in circuit with duplex Dorr classifiers.

Overflow from the washing plant classifier goes to a 40-ft. thickener. Clear overflow containing soluble copper goes to the cement copper precipitating plant for copper recovery. Spigot product goes to the flotation plant or to one of the grinding plant classifiers.

Ball mill product goes to thickeners for dilution control and then to the 125-cell flotation plant.

Concentrates are cleaned and recleaned to give copper concentrates assaying about 20% Cu; 2.0% Zn, 42.0% S; 33.0% Fe; 0.07 oz. Au; and 0.70 oz. Ag. These are pumped to a 50-ft.-diameter thickener. Spigot product goes to an 11½ x 10-ft. Oliver filter.

A "slapper" has been installed on this filter which permits a 0.5% to 0.75% lower moisture content. The slapper consists of a slowly rotating horizontal shaft mounted above the descending side of the drum filter. Attached to this is a strip of rubber belting which slaps the filter cake as it rotates, closing the cracks in the cake, thus preventing any leakage.

Moisture content of the cake is about 12%. When it is desirable to dry it further, the cake drops directly to the hearth of a 12 x 44 ft. Lowden drier. Average service of the Oliver filter cloths is 4,500 tons of concentrates.

Flotation rougher tailings are pumped at the rate of 1,500 to 1,700 tons per day to two 8-ft. Dorr duplex classifiers with 16-ft.-diameter bowls. Overflow from these goes to large hydroseparators. Classifier and hydroseparator sands are combined to produce high-grade fine, granular, slime-free pyrites known as "flotation pyrites," or "pysands." This assays about 50% S, 44% Fe and about 0.70% Cu.

Solids content of hydroseparator overflow assays about 2.2% Cu, 42.0% S, and 35.0% Fe. It is approximately 95% minus 325 mesh and is stored in special tailing dams.

Treatment of Gold-Silver Ores

Metallurgical treatment of the very unique devil's mud gold-silver ores presented unusual problems. During early mining operations, before wet metallurgical methods had been developed, the selected high-grade crude ore, 1 to 2.5 oz. gold per ton, was shipped in cargo vessels to Hamburg for pyrosmelting.

Flowsheet for treatment of the devil's mud gold-silver ores as eventually developed included dry crushing to about ½ in. maximum size. The extremely corrosive crushed ore, although apparently dry, usually contained more than 20% of H_2O, principally as "water of crystallization," and in addition, about 15 to 17% of water-soluble materials. The ore was fed at rate of 100 to 150 tons per day to a cylindrical wet-grinding pebble mill constructed of wood and lined with eucalyptus wood blocks set with end of grain exposed to the grinding action. Selected river-bed pebbles of tough, dense diabase (no quartz pebbles were available) were used for grinding media, as iron would not withstand the corrosive action of the pulp.

The pebble-mill discharge passed to an acid-proof Dorr classifier. Classifier sands, which still contained some corrosive salts, passed into a small Hardinge mill with acid-proof protection between shell and liners. Grinding was done with chilled cast iron balls. Overflow of classifier and Hardinge ball-mill discharge were combined as feed to two standard size acid-resistant Wilfley tables, which produced a good grade of gold-silver concentrates containing pyrite and heavy minerals. Table tailings passed over corduroy gold-recovery tables.

Cyanide Plant

Tailings from these tables, relatively free from sulphides, constituted feed to cyanide plant. First step in cyanide-plant operations was removal of the corrosive solutions. Approximately 15 to 17% of the weight of dry ore was contained in these solutions. Most of the solutions were removed by diluting until approximately 75 to 100 tons of water had been added per ton of dry ore treated, and then dewatering to about 30%. Apparently this should remove about 95 to 96% of the water and water-soluble salts.

Thickener spigot product passed to agitating tanks for addition of nearly 60 lb. of lime per dry ton of ore. From these tanks it was pumped to cyanidization agitation tanks. Notwithstanding such careful washing and neutralization, consumption averaged from 5.0 to 7.5 lb. of sodium cyanide per ton of ore cyanided.

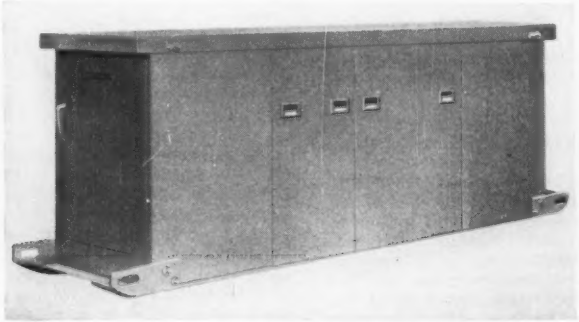
Clear cyanide solutions were obtained from the pulp by countercurrent displacement in Dorr-type thickeners, and by settling the last spigot discharge in the tailings settling ponds.

1. H. A. LONDON, electrical engineer for Duval Sulphur and Potash Co. and formerly with Westinghouse, has worked with companies in Carlsbad to improve underground electrical equipment. Here he is working on a mine power center (seen from secondary end). The same unit is shown in photograph No. 5, on p. 94.

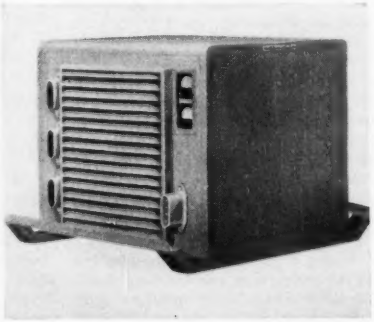
More Power for Potash Mines Through Better Distribution

A. B. CHAFETZ, Assistant Superintendent
Maintenance and Engineering Department
International Minerals & Chemical Corp., Carlsbad, N.M.

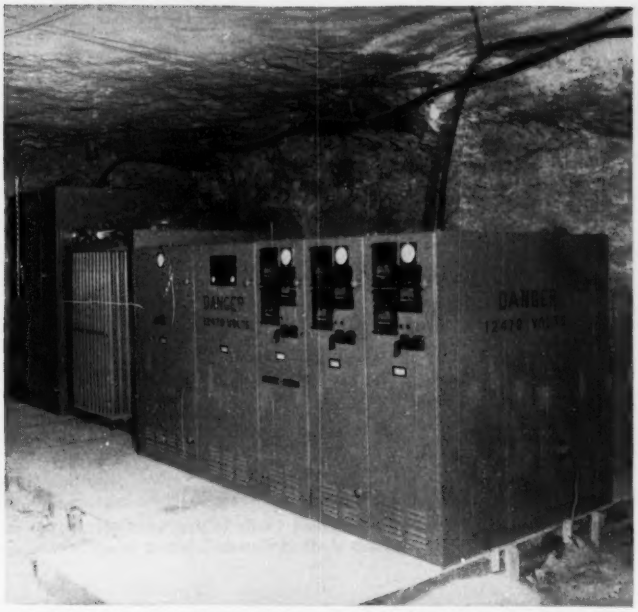
WHEN THE REQUIREMENTS of World War II forced the three companies mining potash in the Carlsbad field to step their production up rapidly, they found that the 2,300-v., ac pri-



3. SWITCH HOUSES for installation planned by Southwest Potash Corp., which will include two load centers, are designed to be 110 in. long, 30 in. wide, and 42 in. high. They are mounted on skidding plates.



4. PORTABLE SELENIUM RECTIFIER is tapped into load side of switch house in Photo 3. It will furnish power for three shuttle cars.



2. NEW 750-KVA MASTER UNIT SUBSTATION installed in U. S. Potash Co.'s mine is rated 12,470/2,300 v. Besides usual transformers and breakers it contains battery-charging selenium rectifier. Components were lowered separately.

mary power distribution system which had been in use underground in their respective mines was no longer adequate. A change was necessary.

Up to that time the output of potash in the Carlsbad region had been rather limited and the mine workings of United States Potash Co., the Potash Company of America, and International Minerals & Chemical Corp. were not too extensive. For operating the equipment used in the face, the three companies had standard 2,300/230-v. distribution transformers connected in a delta bank to transform their primary voltage down to 230-v., three-phase, 60 cycle ac.

Most of the haulage was handled by 13-ton, 275-v., dc locomotives. In the period mentioned, the companies found that one or two 150-kw., synchronous motor-generator sets were sufficient to handle all of their dc current requirements for haulage. Most of the main-line trolleys were 6/0 trolley wire with 500,000-cir. mil. feeders in parallel. Branch trolley lines in the working areas were size 4/0 and were paralleled with 250,000-cir. mil. feeders.

Postwar demands strained production facilities of the three companies still further. By 1947, the workings in all the mines extended out several miles from their main hoisting shafts. In cases, production had risen more than 600%. Additional levels had been opened and more working faces made available. The operators saw that the increased production rate called for better mining, more suitable equipment, and changes in the utilities systems serving the workings.

Surveys of their distribution systems were begun to determine the best way of modifying their methods of getting power at the working face. Experts were called in from manufacturers to help develop equipment that would satisfy the conditions.

The companies also consulted the U. S. Bureau of Mines, the State Bureau of Mines and the State Mine Inspector. Much of the credit for the changes made must go to these organizations.

In the spring of 1952, the Duval Sulphur & Potash Co. began operations. Another company, the Southwest Potash Corp., is expected to begin underground work this fall.

The Early Installations

To take these companies singly, U. S. Potash was the first to get into operation in the Carlsbad field. All of its primary distribution system was 2,300-v. ac. Power was brought down the shaft by a three-conductor, lead-covered cable. This was tapped through fused disconnects at various points. The 2,300-v. feeders radiated from the disconnects and terminated in banks of three 2,300/230-v. transformers for three-phase power at 230 v. This type of distribution, as already said, was standard for all three companies.

With minor changes, the portable substation consisted of the following equipment and accessories:

1—200-amp., 5,000-v. rated oil circuit breaker with series trip coils.

4—400-amp., 600-v. rating, air circuit breakers with dust- and moisture-proof cases.

1—10-kva, 230/115 v., dry-type, single phase, lighting transformer with fused cutout.

1—Skid base with circuit breaker racks on three sides, and transformer secondary bus across the top.

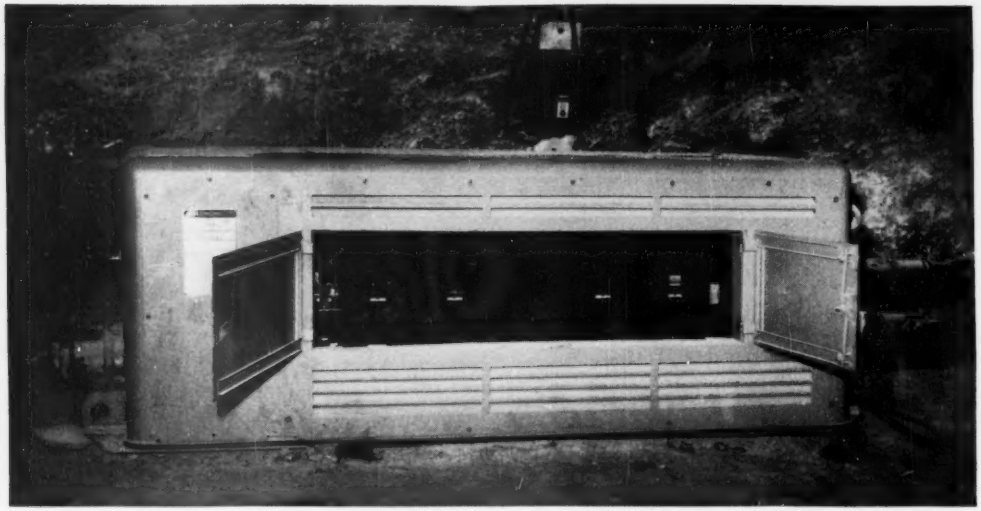
In some cases, a 300-kva., three-phase, dry-type transformer was used instead of the three single-phase transformers, to make up the portable bank.

The Potash Company of America and International Minerals used relatively the same method in bringing power to the face. In some cases, additional 2,300-v. feeders were put down auxiliary shafts to supplement underground power. All of the secondary, or low-voltage systems were similar. The secondary feeder circuits radiated from the substation breakers out to the working faces, usually located between 500 ft. and 1,000 ft. from the portable substation. Prior to the war, these circuits were either 2/0 or 4/0, rubber-covered cables rated at 600 v. After a few years of operation it was found that the dust and moisture-proof cases were not necessary on the secondary breakers and standard sheet steel enclosures were used thereafter.

Changes Are Planned

As mentioned, the increase in production and corresponding increases in distances caused the companies to plan changes which would be adequate to serve present needs as well as meet problems which would arise in the future.

The U. S. Potash Co. decided to use a 12,470-v. primary distribution system and has initiated the first step in converting over to this system. They have lowered and con-



5. MINE-POWER CENTER made by Westinghouse is seen here with doors open showing secondary breakers. (Same unit in Photo 1). It is skid-mounted and can go down smallest shaft in Carlsbad region in one piece.

nected a 12,470-v. cable in their shaft. It is Neoprene-jacketed, three-conductor, Type G cable with copper shielding tapes and semi-conducting tape around the conductor insulation. The cable feeds their first high voltage mine power center, which is a 750-kva unit substation specifically designed by the General Electric Co., to be dismounted in the field in order to go down their 44 x 64-in. shaft.

The 750-kva. substation consists of an incoming line section complete with a primary fused interrupter switch that is key-interlocked with the secondary breakers. The power fuses have an interrupting capacity of 179,000 kva. at 2,400 v. The transforming section is rated 7,200/12,470Y-v. — 2,400/4,160Y-v. This liquid-filled transformer is complete with taps, removable radiators, and is furnished in a standard sealed tank construction complete with standard accessories and a delta wye terminal board together with a top oil dial type thermometer. The auxiliary section contains a Pyranol control power transformer, storage battery for breaker tripping, and selenium oxide battery charger. Each of the three feeder breaker compartments contains three overcurrent relays, the current transformers, and a Magne-blast type circuit breaker having an interrupting rating of 50,000 kva.

The transformer is designed so that it can be tipped over and hauled on its side, which is necessary in moving from point to point in the mine. Consideration had to be given in this type of design to eliminate damage to internal coil structure.

The interrupter switch section has a height of 90 in., the transformer a height of 75 in., and the switchgear a height of 64 in. By making the radiators removable, it was possible to reduce the size of the largest unit so that it could be accommodated in the skip for lowering into the mine. Photo 2 shows this unit. The 2,300-v. feeders radiated from this substation to the smaller existing substations in the working faces where further step-down to 230 v. is made.

Potash Corporation's System

The system at P. C. A. is essentially a 2,300-to-230-v. system. In one of the new working areas located at some distance from their main haulage shaft, they have put in an overhead 12,470-v. hi-line and have dropped a 15-kv. feeder cable to the bottom of their new shaft. At this point, the 12,470-v. circuit is transformed to 2,300 v. to connect into the existing 2,300-v. distribution system in this area.

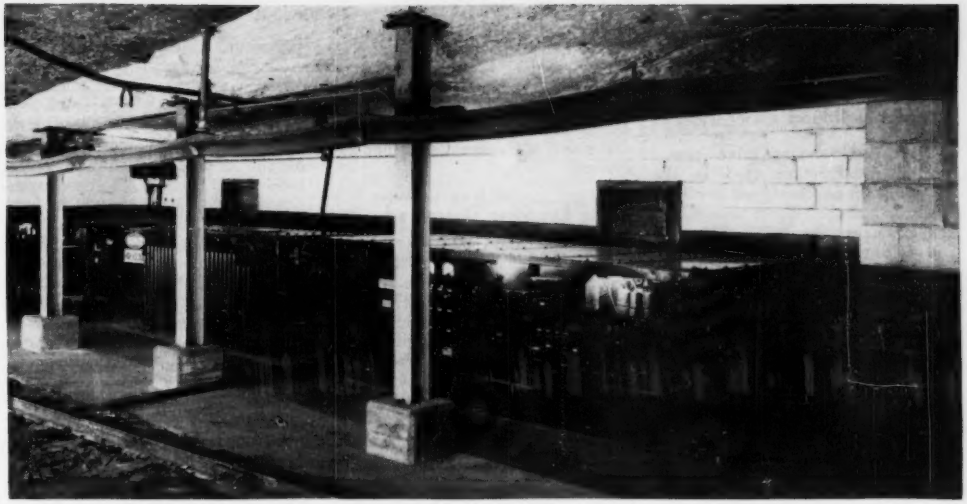
In the area in which the Continuous Miners are used, 2,300-v. to 440-v., three-phase transformers are used to furnish power for these machines. The transformers are the Westinghouse mine power centers and are rated at 450 kva. In all other sections, 230-v. circuits are used in the faces. A description of the mine power center follows later.

Two Load Centers for Southwest

Southwest Potash Corp. plans to install a three-conductor, 4/0, 5-kv. mine power feeder down their shaft to connect with two underground load centers. These load centers are manufactured by the Westinghouse Electric Corp.[1] and consist of a 600-amp., 4,160-v., three-pole, single-throw, 100,000 kva interrupting capacity, manually operated, oil circuit breaker with two cover plates, 5-amp. transformer trips for line overcurrent, one cover plate ac shunt trip for ground current and one auxiliary switch, two-pole double throw. The oil circuit breakers are of the draw-out type. The switch houses are designed to be 110 in. long, 30 in. wide and 42 in. high, and are mounted on steel skidding plates. Disconnecting switches are provided ahead of the breakers. Photo 3 shows this switch house.

Mine feeders which are three-conductor, 4/0, 5-kv. mine power cables, radiate from these switch houses to mine power centers located near the working faces. These mine power centers are rated at 112½ kva. Each mine power center will accommodate a loading machine, loading elevator, a car puller, and a jumbo drill. A tap is made on the load side of the switch house

[1] See also *E&MJ*, Sept., 1952, pp. 114-115.



6. COMPLETE RECTIFIER EQUIPMENT consists of these units, each of which can be lowered endwise from hoist cage through man and material shaft. Inside dimensions of this shaft are 56 x 84 in.

and a circuit is run to a 50-kw. portable selenium rectifier. These rectifiers will furnish power for three shuttle cars. The shuttle cars will move material from the working face to the loading elevator located at the transfer point. Photo 4 shows the rectifier.

Duval Sulphur & Potash Co. has two Neoprene-jacketed, Type G, three-conductor cables installed in their shaft, operating at 4,160 v. The cables terminate in switchgear containing oil circuit breakers rated at 600 amp. with 100,000 kva. interrupting capacity. At present, one feeder has been installed from the switchgear to the working faces to feed the Westinghouse mine power centers at the faces.

Switch houses and selenium rectifiers will be used in the future as the workings are extended out from the shaft bottom. This equipment duplicates that already described with respect to Southwest Potash Corp.

International's Installation

The original power supply to the underground workings at International consisted of one 4/0, three-conductor, varnished cambric, insulated, leaded, steel-wire armored cable, insulated for 5,000 v. Soon after operations began in 1940, an additional cable was put down No. 1 shaft. The two cables were sectionalized to feed the 800-ft. and 900-ft. levels. Primary feeders at 2,300 v. radiated out from these main power feeders. They were size 2/0, jute-covered Parkway cables. The 2,300-v. to 230-v. system is still used at International. However, a change is being made in the extension to the present 900-ft. level.

A 12,470-v. hi-line was erected cross-country to the No. 3 shaft. At this point a 2,500-kva. Allis-Chalmers transformer was installed to transform voltage down to 4,160 v. This has two breaker cubicles. One connects to the hi-line, carrying 4,160 v. overhead to the No. 4 shaft, and the other to a three-conductor, Type G, shielded, 5-kv., Neoprene-jacketed mine power feeder down the No. 3 shaft. The secondary, or 4,160-v. side of this transformer, is connected in wye with a neutral point grounded through a 50-amp., 50-ohm resistor. The three conductors of the cable are arranged to go through a doughnut-type current transformer. A 2.0-6.0 ampere, Type CO relay is connected in the current transformer circuit to measure ground currents. The current transformer has a ratio of 25/5 amp. so that a ground current of 20 amp. flowing would mean 4 amp. in the ground relay circuit, which would trip the CO relay. A normal 10-amp. ground current would result in only 2 amp. in the relay circuit, so no operation would result.

Protection From Ground Faults

This method gives maximum protection from ground faults in the 4,160-v. primary distribution system. The leakage reactance of the doughnut transformer is not exactly the same for all three-phase conductors which gives rise to a small voltage induced in the secondary when there is no ground fault. However, this effect is so small that it does not present an operating difficulty.

After the underground interconnection is made between the No. 3 and No. 4 shafts, the distribution system will be tied together and sectionalized through the two different circuits mentioned above. All of the new workings will be operated from a 4,160-v. primary distribution system. The shaft cable, which is a 4/0 cable, terminates in cubicles underground. These are made up of disconnected switches, overload relays, ground relays, and oil circuit breakers. From this point, two 2/0, three-conductor, Type G, 5-kv. Neoprene-jacketed cables will radiate to the working areas. The 300-kva mine power centers are used in the working faces to furnish 440-v. power to at least two to three faces at the same time. A 50-kw. selenium rectifier to handle the shuttle cars will also be served by this 300-kva transformer.

Continuous Miners will be used in driving the main entries for development. Present plans call for using one 300-kva transformer behind each Continuous Miner to handle the machine, shuttle cars, and fans. A 5-kv. jumper cable will be made

up in 600-ft. lengths so that the transformer can be moved after each 600 ft. of advance.

Three Sizes of Transformers For Low-Head Operation

The Westinghouse mine power center transformers used in the potash basin are designed for low-head operation. There are three popular sizes: the 112½, 225, 300, and 450-kva power centers. They are nonexplosive, fire-resistant, air-insulated, dry-type construction. The high voltage connections are brought out to a terminal board in order to permit changing connections from 4,160 v. wye to 2,400 v. delta. The four low-voltage receptacles are supplied by Mines Equipment Co. A G&W receptacle is furnished on the high voltage side.

To establish a neutral point for a protective ground system, three single-phase transformers are connected in zig-zag for 440 v. Two 25-ohm resistors are provided connected in between the neutral of the ground transformer and the case. When the transformer secondary is operated at 440 v., the two resistors are connected in series; at 230-v. operation, one of the resistors is shorted out. The resistors limit the ground current under fault conditions to 5 amp. Ground current trips are furnished to trip the low-voltage circuit breaker. The Mines Equipment plugs have two connections for a pilot circuit. The pilot circuit will trip the breaker in the event the plug is pulled while power is on.

In addition to the four 440-v. circuits, a 230-v. lighting circuit is brought out through a 50-amp. breaker. This circuit is adequate to handle lighting in the area supplied by the transformer.

The transformer has a skid-mounting like that shown in Photos 3 and 4. Dollies can be provided for 42-in. track gage so that the transformer can be moved by rail. The transformer is so designed that it can go down the smallest shaft in the basin in one piece.

Part of the dc system is intermixed with the ac system in that in one mine, selenium rectifiers radiate from the 4,160-v. system in order to feed dc operated shuttle cars. At one of the other mines, it is noted that the selenium rectifiers connect to the mine power centers on the 440-v secondary system to feed dc power to the shuttle cars. In the past, it was the general practice to use motor-generator sets operating at 275 v. to furnish dc power for the locomotives and the shuttle cars. Because of the great distances involved now, and because of the flexibility required in present-day operations, it is becoming apparent that future operations will require the locomotive haulage system to be independent of the shuttle-car haulage system.

Rectifier Described

The 200 and 300-kw. rectifiers are now common in the area. A full description of one of the units follows. It is a General Electric portable, mining service, sealed-Ignitron rectifier equipment rated 300 kw., 275 v. dc, for ac, three-phase, 60-cycle, 2,400/4,160-v. power supply. The rectifier consists of the following parts:

AC switchgear car: Consists of standard portable metal-clad unit, mounting automatic reclosing air circuit breaker of 50,000 kva. interrupting capacity, with standard auxiliaries, protective devices, Pyranol-filled control transformer, meters and disconnecting devices, arranged for cable connections to transformer car.

DC switchgear and rectifier car: dc switchgear, dead front mining type unit containing an automatic reclosing dc line contactor with accessories, and including disconnecting means, meters, dc voltage regulator.

Rectifier transformer car of Pyranol-filled transformer, 2,400/4,160 v. primary double wye, six-phase secondary, having two 2½% rated kva. taps above and below 2,300 v., with interphase transformer. Capacity: 100% load continuous; 150% load two hours at 60 deg. C. rise; 200% load one minute.

Rectifier: One 300-kw., 275-v. dc standard portable mining type sealed-Ignitron rectifier, complete with static magnetic firing circuit, protective devices, water cooling system and provision for mounting six tubes.

Heat Exchanger: One water-to-air insulated heat exchanger for operation in a maximum ambient temperature of 25 deg. C. (77 deg. F.) complete with accessories and with a suitable screen enclosure.

Sealed Ignitron tubes: Six Type FG-238-B sealed Ignitrons.

The cars are designed for a standard height above the rail of 48 in. with a track gage of 42 in. The end frame of each car conforms to our standard coupling arrangement on mine cars and locomotives. Each car is designed so that it can be lowered endwise from the hoist cage through the man and material shaft, the inside dimensions of which are 56 x 84 in. Photo 4 shows the complete rectifier equipment.

Main Haulage 15,000 Ft. Long

The usual practice is to use 6/0 trolley wire, paralleled by 500,000-cir.-mil. feeders, on all main line haulage. On gathering lines, 4/0 trolley is usually paralleled with 250,000-cir. mil. feeders. In most of the mines, bonded and cross-bonded rail is used. The new extension to International's 900-ft. level has Thermit-welded 75-lb. rail, cross-bonded every 400 ft. When this main line is complete back to the No. 1 hoisting shaft, it will be approximately 15,000 ft. long. Plans call for operating two 20-ton, 275-v., dc locomotives in tandem on this run.

International's plans call for eventually converting all of the workings over to a 4,160-v. primary system using ground wire protection. A 4,160-v. primary distribution system will be used exclusively underground at Duval and Southwest potash companies. U. S. Potash Co. and Potash Company of America, because of the great distances involved, plan to use 12,470-v. primary distribution systems which will connect to unit type substations to step down to connect into the existing 2,300-v. systems.

Although all the mines use the room-and-pillar method of mining, the distribution systems will vary slightly. These variations are caused by differences in working schedules, in distances involved, in production schedules, and in the types of equipment used at the working face. As labor and material costs advance, changes in technology must be made to meet the demands of increased production. All of the companies are striving for better and more efficient methods of offsetting rising cost.

Acknowledgment

I wish to express my appreciation to the operating personnel and managements of United States Potash Co., Potash Company of America, Duval Sulphur & Potash Co., Southwest Potash Corp., General Electric Co., Westinghouse Electric Corp., Allis-Chalmers Manufacturing Co., and International Minerals & Chemical Corp. for their help in preparing this paper and for supplying the information and photographs contained herein. I am particularly grateful to J. G. Ivy, electrical engineer, International Minerals & Chemical Corp., for permission to make use of certain unpublished reports and papers which had been prepared by him.

"Design Factor" for "Safety Factor" Is Proposed When Considering

Design Working Loads for Operating Wire Rope

L. C. TORELL
Wire Rope Engineer
Bethlehem Steel Co.
Bethlehem, Pa.

WIRE ROPE MANUFACTURERS are commonly asked two questions:

1. What is the proper working load of a given diameter, construction, and grade of a wire rope?

2. What diameter sheaves should be used?

In years past most wire rope manufacturers have published tables entitled "Recommended Sheave Diameters" and "Recommended Safe Loads" for various sizes, constructions, and grades of wire ropes. It has been obvious to most designing engineers, who are completely familiar with such terms as "safety factor" as used in the proper engineering interpretation, that these recommendations were directed to the objective of the longest possible service life from any given rope. They were not primarily related to hazards, risk of life and limb, and safety in the layman's interpretation of those words since the words are far more dependent upon the overall design of the equipon which the rope is used and on the conditions under which the machine is operated.

It is well known, particularly among designers of rope-using equipment, that such recommendations are seldom followed in building mobile equipment, but the reasons why and the results which may ensue if this is not done are not too well understood.

The designer must consider such factors as first cost, overall performance, utility, mobility, and operating cost of the unit as a whole. Wire rope performance and cost may be only one relatively small factor. If the optimum of light weight and portability is a requisite, the attainment of this goal may necessitate the use of relatively small sheaves and drums and a relatively heavily loaded rope which, of course, entails shorter rope service life and a higher rate of rope consumption.

Scrapers and Mine Hoists Illustrate Two Extremes

An outstanding illustration of such equipment design is found in the scraper wagon excavators which operate with wire-rope controls. It is recognized that rope-operating conditions on this equipment are not good from a wire rope engineer's viewpoint; sheaves and drums are small and drum winding conditions bad and there are many reversed bends. The rope can be broken from shock loading by one moment of careless operation, so for this condition the designer has obviously provided very little or no so-called wire rope "safety factor."

Yet these machines have completely revolutionized earth moving. They dig, transport for long distances, and spread huge loads of earth at far lower cost than attained by any previous methods, and without undue hazard to the operators. The low operating cost is attained by good "design" and despite a relatively high hourly rate of rope consumption.

In extreme contrast, consider the conventional mine shaft hoist installation. Here the designers' basic problems are entirely different. The equipment must usually last for the life of the mine, which may be many years, and operate with maximum reliability at low overall cost. There are no portability problems beyond the limitations of the initial transportation and installation of the machinery. Wire rope consumption is a sizable item in overall operating costs, so engineering economics require the use of very large sheaves and drums and other adjuncts that help to insure the longest possible useful rope service life. Such design features can easily be provided in this type of equipment; in fact, here the wire rope engineers' minimum recommendations are commonly exceeded, with the result that the useful rope life attained in this service, in terms of tons moved or ton miles, is at a maximum.

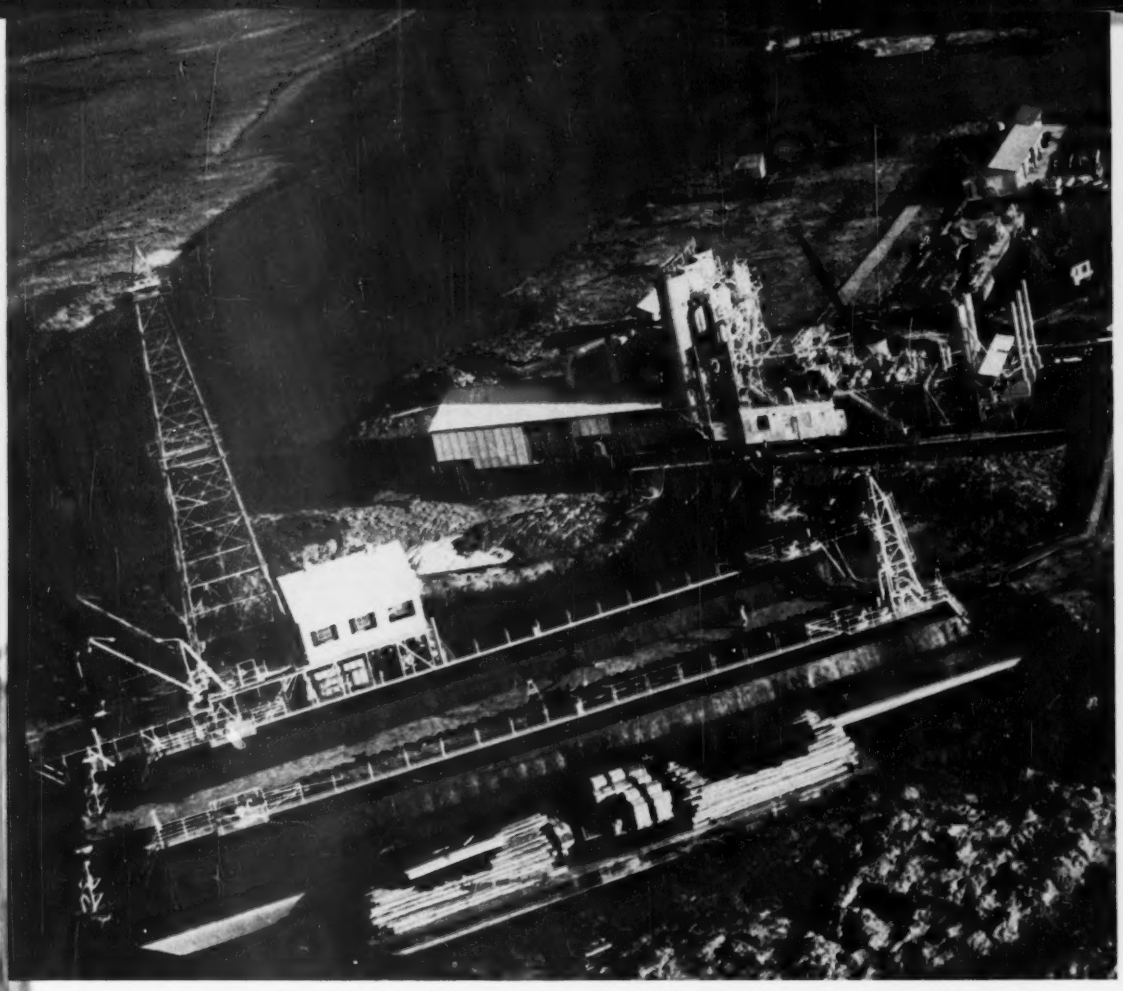
Oil Well Rotary Rig in Between

Between those two extremes is the oil well rotary drilling rig which is a classic illustration of what engineering designers can do with a difficult problem. The petroleum industry accepts as commonplace a unitized rig that will drill a well to a depth of more than 2 mi., handling loads of several hundreds of tons in this normal operation. This equipment is so portable that it can be moved from a completed well to a new location several miles away and be drilling again in a matter of hours. The overall performance and efficiency of these rigs contribute materially to the low cost of today's petroleum products. Wire rope is an important element in this machine; hence the designer must fully consider its longevity and reliability along with the very essential portability of the rig as a whole. However, common sense tells us that the ideal rope operating conditions of a mine-shaft hoist installation cannot be provided here, because of bulk and weight. The huge peak loads occasionally handled by such rigs, as contrasted to the more normal or average operating loads, must be taken care of by increasing the working load on the rope. Engineering economics require these compromises and the result is a rope service life of perhaps one-tenth that attained on shaft hoisting equipment. Other design factors and economics make this practical.

A Wrong Impression

Unfortunately, in a few instances laymen with no understanding of engineering terminology have given the layman's interpretation to such expressions as "recommended sheave diameters," "recommended safe loads," and "safety factor," and have created the impression that if those quite old suggestions of the wire rope manufacturers are not followed, personal safety will be sacrificed. Trained engineers of course understand that "safety factor" is nothing but a name for a ratio of material strength to calculable and foreseeable loading thereon. Such design ratios can and do vary widely, depending on material and overall conditions of use. The engineer designing a given piece of equipment has knowledge of all

(Continued on page 178)



MARINE MINING METHOD requires insulated sulphur barges, floating drill rig, barge-mounted power plant,

Freeport Mines Sulphur by Boat

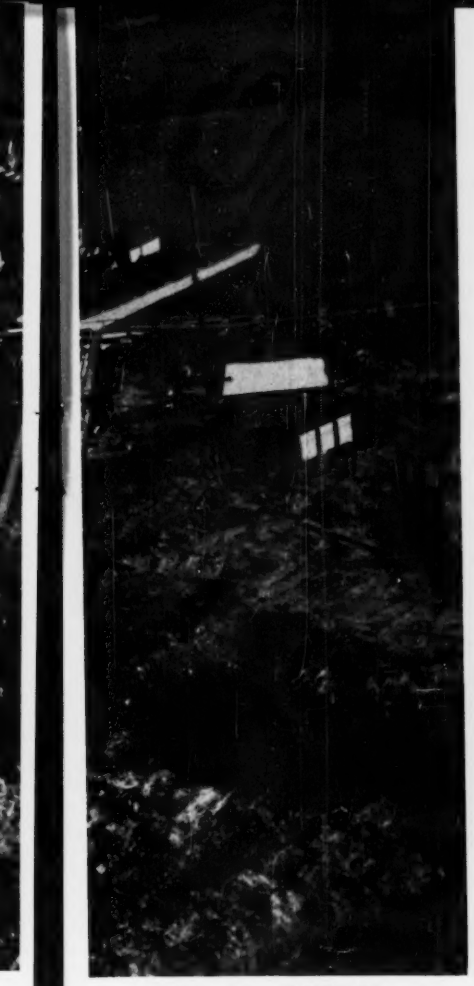
K. T. PRICE, Freeport vice president in charge of Louisiana operations.

K. T. PRICE
Vice President
Freeport Sulphur Co.
Port Sulphur, La.

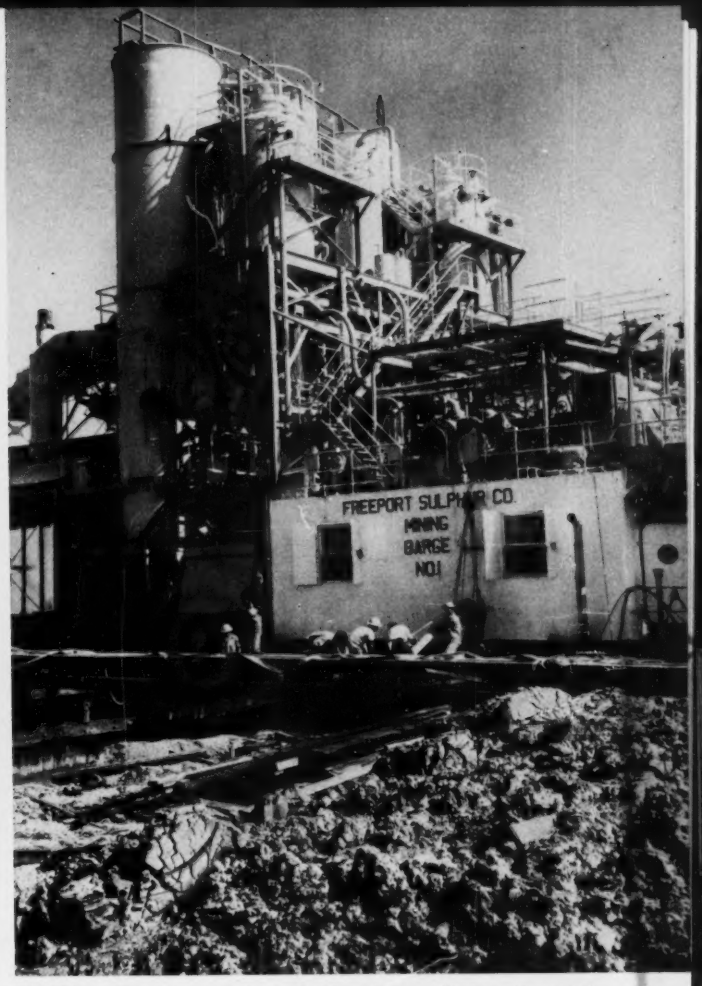
ALTHOUGH FREEPORT SULPHUR CO. has operated in the Louisiana coastal marshes since 1933, its Bay Ste. Elaine mine, which began producing in November, has introduced problems not previously encountered by it or any other producer.

The deposit, located about 160 mi. southwest of New Orleans, lies beneath salt marsh and water. The site can be reached only by boat or plane. The nearest source of fresh water, a major requirement at all other Frasch process mines, is some 35 mi. distant. To cope with these difficulties, Freeport has built the mining plant and facilities on barges and has devised a method by which sea water instead of fresh can be used.

The new operation is in marked contrast in many respects to Grande Ecaille, Freeport's initial mine in the Louisiana marshes. Grande Ecaille is a land-type operation in which the marshland over the orebody was filled and built up by hydraulic dredges. All opera-



storage area and field office.



PLANT supplies air, power, hot water for mining, collects molten sulphur.

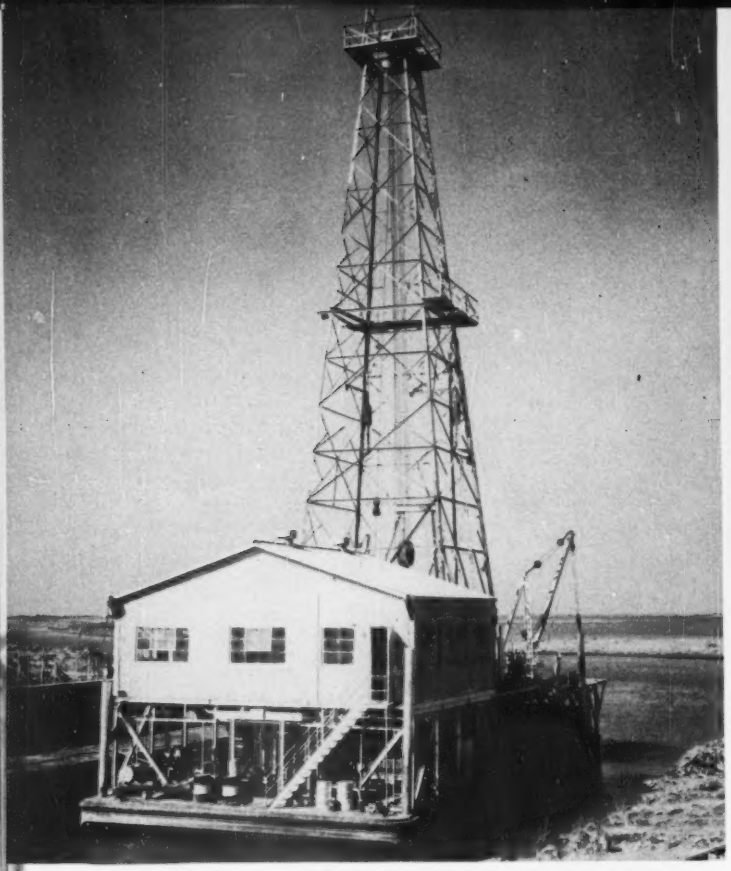
and Barge at Bay Ste. Elaine

tions are off board roads or mats, and material handling has been highly mechanized with fork lift trucks, straddle trucks, tractors, etc.

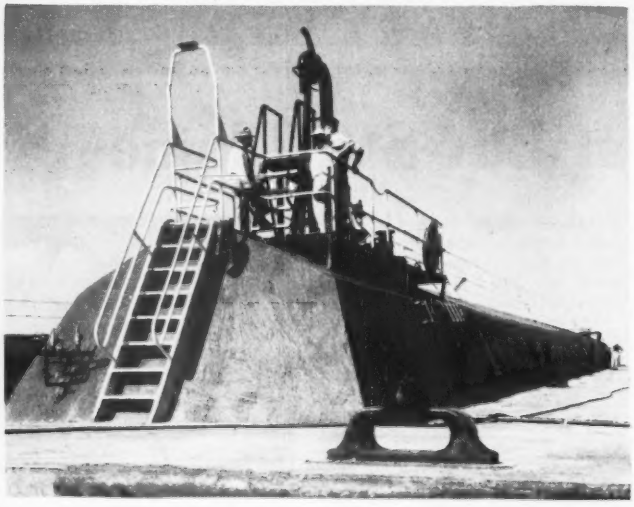
Land mining which requires surface filling was considered too cumbersome and time-consuming to be used at a small deposit having the terrain conditions of Bay Ste. Elaine. Consequently at this property, where production is expected to be difficult and surface settlement negligible, where the area is already half inundated, a complete marine operation requiring no surface fill is being used. Machinery is barge-mounted instead of land-based, boats take the place of trucks and tractors, canals substitute for roads, and pipe lines are supported on piling bents.

The mining plant is designed to deliver an average of 1,750,000 gal. of 325 deg. F. water per day, 400 cfm of compressed air (500 psig), a power load of 600 kw., and miscellaneous steam for heating sulphur lines and equipment. The facilities were installed at Grande Ecaille on a barge 40 ft. wide, 200 ft. long, and 12 ft. deep. The completed mining barge was then towed 65 mi. through bayous and bays.

CHARLES M. SAMPSON is superintendent of Bay Ste. Elaine project.



FLOATING DRILLING RIG will drill and equip new wells, salvage pipe from old wells. At least 3 strings of pipe are set in wells for mining.



1,000-TON INSULATED BARGE will carry molten sulphur to storage bins at Port Sulphur on the Mississippi, 75 mi. away. Round trip takes 36 hours.

DRAGLINE mounted on war-surplus

to the mine site and partially sunk in place. The elevation of the deck is about 6½ ft. above mean Gulf level.

In the operation, sea water pumps pick up the water through screens and pump it to the top of the flue gas heat reclaimers. In the top part of the heat reclaimers, the water comes in direct contact with flue gases discharged from the boilers, and the water is heated to about 140 deg. F. In the lower part of the heat reclaimers, the water comes in direct contact with hot combustion gases from gas burners, which are fired directly into the downcoming water. These burners heat the water to about 190 deg. F.

Mine water pumps take suction from a surge tank constructed beneath the heat reclaimers and pump the 190 deg. F. water into tubular heat exchangers where the temperature is raised to 325 deg. F. The process for heating sea water carrying as much as 1640 grains of salt per gallon to this temperature is the outcome of eight years of research begun initially in the laboratory at Freeport's Hoskins Mound mine.

In the heat exchangers the latent heat of evaporation of the steam is transferred through the tube walls and into the sea water. The condensed steam is then recycled back to the boilers. In this manner, where distilled water is continuously used in the boilers, a water-treating problem is eliminated and

LST will prepare drilling sites for floating drill rig. The mining area is located 35 mi. south of Houma, La.

fresh water requirements are reduced to only that which leaks from the system.

The pressure of the hot sea water leaving the heat exchangers is sufficiently high to convey it through surface pipe lines and inject it down wells into the sulphur-bearing formations. The heat of the water melts the sulphur, which is extracted in molten form from wells.

Since sea water is corrosive to steel, the heat exchangers are constructed of suitable corrosion resistant alloys, and the steel surface pipe lines are protected by cement lining. Chemical treatment of the sea water can also be used to protect the steel piping in the sulphur wells if the corrosion loss should prove excessive. The deposition of scale within the heat exchangers can be controlled by daily flushing of the tubes with steam and by turbining the tubes at approximately monthly intervals.

Three flue gas heat reclaimers are provided. These units are packed towers 10 ft. in diameter and 52 ft. high with two layers of packing. Flue gases discharged from the boilers enter the towers below the upper packing. Beneath the lower packing are gas burners. Beneath the burners is a conical-shaped tank which collects any sludge brought in by the water. The capacity of the heat reclaimers is sufficient to heat 1,750,000 gal. per day, even if one of the units should be out for repairs.

Five package-type boilers, each having a capacity of 30,000 lb. of steam per hour, are capable of heating 1,212 gpm of sea water to 325 deg. F. Sufficient boiler capacity is provided so that no reduction in the output of hot water will occur when one of the boilers is taken out of service for repairs or inspection. Makeup water for the boilers is distilled from fresh water barged from Port Sulphur or from sea water. Excess makeup water is stored in one of the compartments of the barge.

There are a number of shell and tube heat exchangers in parallel, each having three passes. The tubes are made of corrosion resistant alloys. The number and capacity of the heat exchangers is such that 1,750,000 gpd can be handled with

PIPE LINES, steam-jacketed, insulated, and mounted on piling, keep sulphur molten enough to be pumped from wells to collecting tanks on mining barge.

SULPHUR PUNCHER surveys mining area from the plant. Fully automatic controls permit plant and wells to be operated by foreman and three men per shift. Important plant innovation is use of sea water for mining.

two of the heat exchangers out of service for turbining. For future expansion in capacity, space has been provided for some additional heat exchangers.

Two turbine-driven air compressors are provided, either of which can furnish the entire air requirements under normal circumstances. Two 300 kw. turbo-generators supply power for sulphur pumps, bleedwater pumps, small motors in the shops and for lighting. Steam turbine-driven pumps handle the sea water and boiler water between the various units. All pumps, air compressors, turbo-generators and other machinery are located below deck, and boilers, heat reclaimers, heat exchangers, sulphur relay station, switch gear and control house are located on the deck of the barge. The sulphur relay station is located on the end of the barge near the heat exchangers. The controls for boilers, direct-fired burners, heat exchangers, electrical system, sulphur relay, and all other functions are located in the control house which is the center of operations.

The plant is designed for simultaneous production of six wells and has a production goal of 100,000 long tons of sulphur per year. The sulphur will be stored at Port Sulphur, Freeport's shipping point on the Mississippi River. The sulphur will be transported in molten form in two 1000-ton insulated tank barges to the Port Sulphur storage bins 75 mi. away. The barges measure 224 ft. long, 39 ft. wide, and 8 ft. 5 in. deep and carry a horizontal cylindrical tank of about 1,500,000 gal. capacity. They will be towed by an 800-hp. twin-screw diesel towboat.

Under normal conditions, a round trip from mine to storage and return (150 mi.) will take 36 hours. But fog, winds, storms and tide conditions will interrupt scheduled transportation. Stand-by capacity has been incorporated in the barges to circumvent shutting down of producing wells. Although the barges are equipped with steam coils to prevent freezing of sulphur, no heat need be applied while enroute because insulation will prevent excessive heat losses.

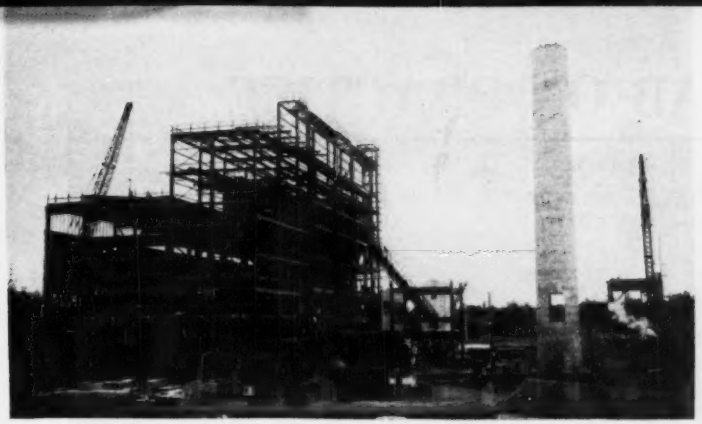
With permanent shop facilities at the Grande Ecaille mine and storage for Bay Ste. Elaine sulphur provided at Port Sulphur, personnel normally required for this work at the mine site is minimized. Total personnel requirements are put at about 100 employees with 80 to 85 at the mine and the remainder based at Port Sulphur and Grande Ecaille.

The plant, including operation of the sulphur wells, will be run by three operators and one foreman per shift. Fully automatic controls on the boilers, tower burners, pumps, heat exchangers, centralized in the control house amidship permit this small force to maintain constant control of all operations. For example, soft sludge forms in the tubes of the heat exchangers which reduces the heat transfer rate. About once a day the tubes must be steam-flushed to remove this sludge. This process requires 16 separate valve operations performed in rapid sequence and so is beyond the physical ability of one man to handle manually. Instead, the complete flushing cycle is done automatically and requires only about eight minutes.

Profit In Doubt

It is not anticipated that the Bay Ste. Elaine plant and process will prove preferable to the conventional sulphur mining plant where fresh water is available. While the initial plant cost is less, operating costs are expected to be higher. Freeport, in fact, has advised its stockholders that it may not be possible to establish profitable production at this property at the present price of sulphur.

This new type of marine mining, with its barge-based facilities and utilization of sea water, has made possible, however, the development of a deposit upon which conventional sulphur mining methods could not be employed. Moreover, the role of the "amphibious" mining plant at Bay Ste. Elaine is not confined to this deposit alone. Should further sulphur mining opportunities arise in the coastal marshes, the plant may be re-floated and put into service at other locations.



MINNESOTA POWER & LIGHT's new plant near Aurora is semi-outdoor design; boilers will be between steel structure and stack. See p. 118.

Who Will Supply Power For Processing Taconite?

Beneficiation will require 100 kwhr per ton, in developments under way on Mesabi. Settlement of negotiations for power is pending.

AN ESTIMATED MINIMUM of 600,000-kw. generating capacity will be required for processing taconite under the projected development programs on the Mesabi Range, according to the Nov. 24 issue of *Electrical World* (published by McGraw-Hill). To produce a concentrate from taconite that is satisfactory for use in today's steel mills, the iron content must be increased from the 25 or 30% or less contained in the rock to at least 60%, which is higher than the grades of iron ore normally mined. This requires crushing and grinding, washing, magnetic separation, and agglomeration into sizes suitable for the steel mills. In the estimate made it is assumed that 4 tons of rock will produce 1 ton of concentrate which will contain 60 to 65% iron. Estimates of electrical requirements have been upped first from 60 to 80 and now to 100 kwhr per ton of concentrate. Power demand is now estimated at 12,000 to 15,000 kw. per million tons per year of ore concentrate capacity.

(An article in *Engineering & Mining Journal*, July 1952, discussing the outlook for the production of iron from taconite, estimated that the output of finished concentrates in 1960 would be not less than 10-million tons per year.)

Power Supply. Minnesota Power & Light Co., the power company serving the area, is presently furnishing power to the two experimental plants already in operation and is under contract to supply a third plant when it goes into operation next year. Whether, however, the power company will supply the large commercial plants to follow, whether they will be supplied by the mining companies themselves or be cared for on some joint basis, has not yet been determined. Negotiations are still in progress and some of the power will probably be supplied by the power company and some by the mining companies.

A power plant, designed for Reserve Mining Co. by Sargent and Lundy, is to be built adjacent to the ore concentrating plant near Beaver Bay. Initial installation will be one 40,000-kw. unit.

Moving the Ore. Taconite will be mined by Reserve Mining Co. in the vicinity of Babbitt, Minn., and shipped by the company's private railroad to the plant near Beaver Bay on Lake Superior, a distance of 47 mi. This transportation by rail is offset by proximity of lake shipping facilities near Beaver Bay for the finished concentrate and an unlimited supply of water from the lake for condensers and for processing.

Large quantities of cold Lake Superior water passing through the processing plant will add to plant heating costs. To reduce this problem to a minimum, all condenser discharge water will be used in the taconite processing operation, taking advantage of the 10 deg. F. temperature rise in the condenser.

Initial installation in the power plant will be one 40,000-kw. unit. Three such units are planned for the ultimate future, bringing total plant capacity to 120,000 kw. which can be increased to meet requirements of the Beaver Bay taconite plant.

Due to high fuel costs, a plant of high efficiency is warranted. Low temperature of Lake Superior water will lend itself to the high efficiency design.

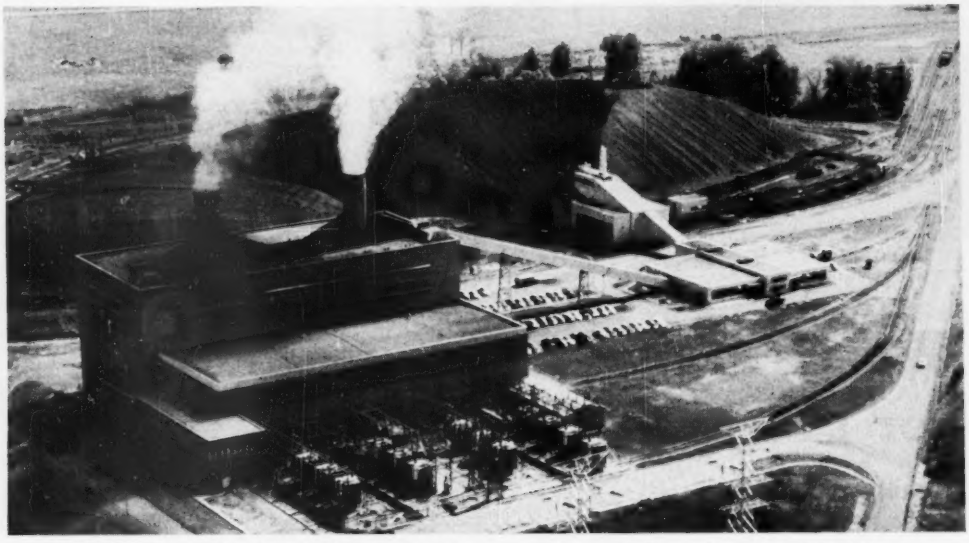
Power requirements for mining at Babbitt will be less than those for the processing plant. They will be supplied either by Minnesota Power and Light Co. or over a 115-kv. line from the plant near Beaver Bay. Details of line design have not been determined, but single pole construction with wishbone-type crossarms is being considered because it is adaptable to the curving, narrow right of way. The line is expected to carry an ultimate maximum of 20,000 kw., but conductors will be sized for double this capacity.

Erie Mining's commercial processing plant will probably be in the vicinity of Aurora on the Mesabi, 5 mi. east of the present pilot plant and the taconite quarry. The power plant probably will be located on Lake Superior, at Two Islands where an unlimited supply of 42 deg. F. water is available. A new harbor and rail terminus at Two Islands will handle taconite pellets produced. The power plant may expand to 180,000 kv. or more. This arrangement will involve a 70-mi. 220-kv. steel tower transmission line between power plant and processing plant.

New Project. To meet normal load growth in the area plus that caused by anticipated accelerated development resulting from taconite operations, Minnesota Power and Light Co. has under construction a semi-outdoor generating station of two 44,000-kw. units near Aurora.

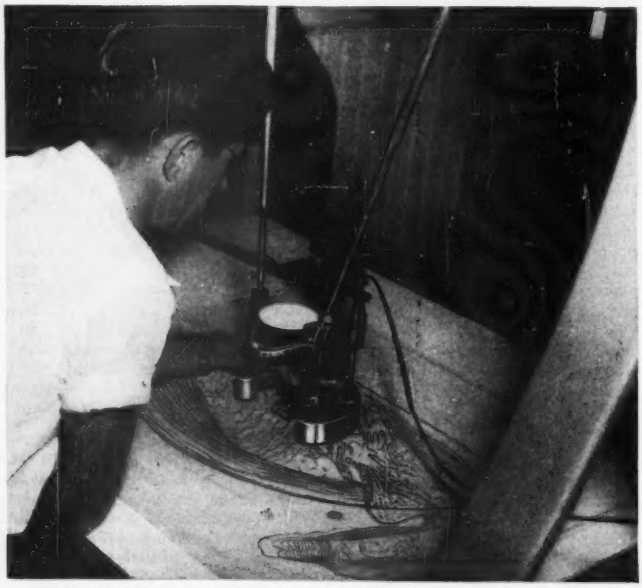
(*Please turn to page 118*)

KEEPING TAB ON PRACTICE



1. TAKING THE PICTURES. Plane is approaching one of TVA's stockpiles at 140 mph and 1200 ft. up.

Stockpile Can Be Measured From Air

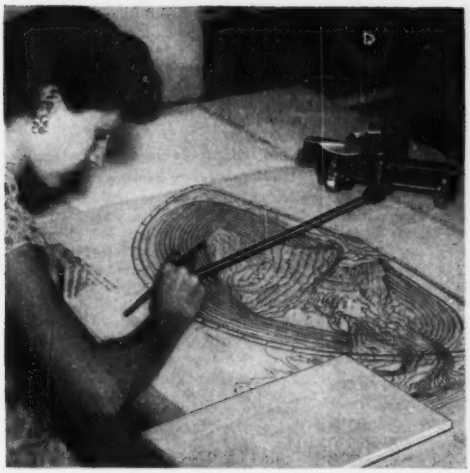


2. REPRODUCTION IN GLASS is made of each picture, and glass plates are set above table in projectors of instrument shown. Relief map, to scale, is made.

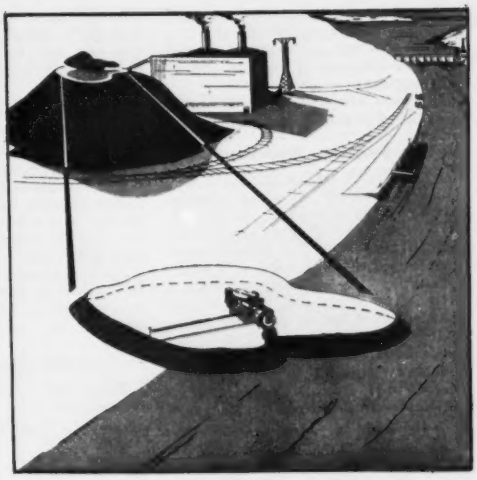
EXPERIENCE of the Tennessee Valley Authority is said to show that measurement of big stockpiles by a combination of aerial photography and stereoscopic topographic mapping is cheaper and takes less time than the former method of measuring them on the ground. As much as 25% can be saved in man-hours and cost, depending on circumstances. The method can be used to determine the volume and weight of any stockpile.

TVA is applying the method to coal stockpiles at its steam-electric power plants and to stockpiles of chemicals and minerals at processing plants. The Authority has about 45 different stockpiles located at seven points as far apart as 200 mi. To take an inventory using the method described is now a matter of hours, compared with several days formerly required by survey crews at each location. Accuracy up to 97% has been obtained. The accompanying pictures show how the work is done.

To take the pictures, the plane flies at 140 mph at 1,200 ft. elevation (Picture 1). The height depends on the mapping scale desired. This is generally 1 in. to 40 ft. Two pictures are taken to give an overlap of 60% in the line of flight. This provides stereoscopic coverage of the stockpile, so that the relief, or height of the



3. THIS MAP, drawn with contours, makes use of planimeter possible to measure volume in cubic feet of each 1-ft.-high segment of stockpile.



4. VOLUME OF MATERIAL is measured by planimeter for each section between 1-ft. contours. Weight is computed, using density as determined by ground tests.

pile, can be seen in the stereoscopic mapping machine.

After the pictures are developed, a reproduction in glass is made of each. The glass plates are then set above the table in the projectors of the instrument shown in Picture 2. The resulting images, beamed through the twin projectors, are translated into a relief map, drawn to scale.

Permanent identifiable points, on which known horizontal positions and altitudes have been established at each stockpile, are used for ground controls. With the stereo-plotting machine, 1-ft. contours are then drawn directly on a sheet showing contours of the original ground or stockpile base.

With the planimeter (Pictures 3 and 4), the area bounded by each contour is measured and the volume in cubic feet of each 1-ft.-high segment of the stockpile determined.

The volume of all the individual segments gives the total volume. This figure is then converted into tons.

The weight of mined material in a pile varies considerably, depending on its fineness and the type of equipment used in piling, spreading and compacting the material. Samples from various spots on each pile are weighed and the unit weight determined from them. At TVA's coal piles, the weight varies from 56 lb. per cu. ft. to 72 lb. per cu. ft.

All photographs required can be taken on the same day and become permanent records which can be easily checked or reviewed later, as may be desired.

How Goes the Airleg Drilling Combination?

Sixteen operators in Canada who were among the early users discuss their current practice. New drills developed for this work are receiving attention.

WHAT IS THE CURRENT STATUS of drilling practice involving the use of light airleg-mounted machines and tungsten carbide-tipped forged steel? This mode of drilling, introduced in Canada by Swedish manufacturers almost four years ago, quickly won popularity in many districts, particularly in northern Ontario and Quebec. Ease of handling and the drilling speed achieved figured prominently among the advantages gained.

A survey of 16 Canadian companies which early adopted this type of equipment for drilling at least part of their ground, shows that it is still popular but is undergoing certain changes. In the following notes, numbers rather than names are used to designate the companies.

New Models of Drills

MINE NO. 1, QUEBEC. The use of light airleg-mounted drills with carbide-tipped forged steel is steadily increasing at this property, located in Quebec. Most stoping and drifting operations use this type of equipment and it is expected that the conventional equipment will soon be replaced completely for these applications.

Since the original Swedish drills were introduced, new models have been produced both in Europe and by manufacturers in Canada and the United States which give faster drilling speeds without interfering with bit life.

A recent development, with which the company is experimenting and which it feels will be useful in the future, is the 2⅝-in. cross-wing carbide detachable bit which is made in England and is being used for drilling the large hole that forms part of the regular cut in drift rounds. This hole is drilled with the light airleg equipment and takes the place of the large hole formerly drilled with forged steel and standard leyner-type drills.

Four Airleg Drills Here

MINE NO. 2, QUEBEC. Light drills have unquestionably revolutionized drilling in this region, this operator says. Each camp seems to have its preference due to the hardness and abrasiveness of the rock.

The four drills using the airleg that seem to have gone ahead fastest are: Joy LM47, Gardner-Denver S48, Holman SB25 and the Atlas (Swedish) RH655. Of these, two are too light for the rock at this mine. The chisel-type

bit has been unsatisfactory. The company has concentrated on the Joy LM47 machine and their four-wing bits. The Holman airleg has proved very satisfactory.

Chippewa drill steel, made by Atlas Steel Co., Welland, Ont., is being used.

Better Carbide, Heavier Drills

MINE NO. 3, QUEBEC. Light machines and airlegs of several makes have appeared in the area in the past few years, many of them of excellent quality and design. The present tendency seems to be toward a slightly larger and heavier machine with a little faster penetration speed. In addition, local shops all over the country are turning out carbide-tipped forged steel.

Another tendency may show itself more as time goes on. When carbide first came out, it could be used only with light drills (2¾-in. bore or less for holes of 1⅝ in. diameter or less), due to the smashing of the carbide under the blows of the prevalent heavy machines. Improved technique and metallurgy changed this picture so that the carbide now stands up better and can be used with heavier drills. For example, the company is using a 1⅝-in. four-wing carbide bit with 1-in. Q.O. steel in combination with 3½-in. leyners and 3-in. stopers for all drift and raise work. Performance is satisfactory.

Speaking generally, this operator says that in flat-back shrinkage, flat-back cut-and-fill, and square-set mining, the light equipment is definitely in favor. For development work, however, especially where jumbos are used, the heavy equipment with tungsten carbide is a tough combination to beat and may find even wider use.

Working on Larger Drills

MINE NO. 4, QUEBEC. This company has practically changed over completely from detachable steel bits to carbide-tipped forged steel using jackleg drifters and stopers instead of conventional leyners and stopers. It finds that the drills can still stand mechanical improvement with use of better alloys in certain wearing parts.

With the continued demand for higher wages, the management thinks that somewhat larger and more powerful machines will have to be used.

The company at the time of writing has tried a Meudon (French) jack drill only two shifts, finds it unbalanced but well built, cheaper than any other on market, 20% faster drilling.

Two large Holman drills were also being tried and seemed to drill faster than the light airleg drills first installed.

Miners were showing objections to larger drills, saying they are more tiring. Perhaps this is so when they are drilling slash holes in the back of stopes. However, breast drilling should not be more tiring.

As this company had just started work on larger drills, they had no figures to offer but thought that if any mine is changing over from leyners, it should go to larger jacklegs to avoid the prejudice they were experiencing from the miners.

Trend at Peak?

MINE NO. 5, QUEBEC. The use of the light airleg drills and equipment which were on test early in 1950 was discontinued at that time.

The general trend at this mine is to the use of Canadian Ingersoll-Rand and Holman airlegs with Holman carbide-insert bits.

As to the recent wide use of Swedish airleg equipment, this operator thinks that the trend has reached its peak.

100% Swedish Here

MINE NO. 6, NORTHWEST TERRITORIES. This company has gone all out for Swedish equipment with carbide-tipped rods (the second in Canada to go 100%) and sees no reason for changing. The following opinions will apply only to the company's own conditions. The rock is unusually hard. Since it is not greatly fractured, it is easy to gage.

Cost per foot drilled with tungsten carbide steel and lightweight airleg machines is about five-ninths of the cost with leyner gear and steel bits. At present, Swedish drills and steel have an advantage, mainly because of the balance between the machine and steel. Other machines tested will drill faster, this operator says, but the extra drilling will not greatly alter the amount of work a machine man will do in a day, and the extra blow required to give the faster drilling cuts the life of the steel greatly. The average life would be about three-fifths.

In this management's opinion, many mines, in restricting the use of airleg machines to stopes and slash work, lost a great deal of their advantage. Where this equipment really pays off is in development work for the following reasons: It is easier to train drift and raisemen with this equipment. In raises, it greatly reduces the weight of material required. In drifts, the time saved in setting up is much greater. In both cases, there is an actual decrease in cost per foot drilled. By drilling a smaller hole and using a smaller diameter cartridge, there is a marked reduction in powder consumption.

Possibly the greatest advantage is in the smaller capital investment. Not counting the mucking equipment, two airleg machines will cost roughly $1,000. If a jumbo and two leyner drills are used, the value jumps to about $6,500. By using a jumbo and carbide-tipped rods or carbide bits, it might be possible to get a slightly greater advance but this will not be very much greater. The cost of this drilling will be considerably higher.

This company claims it can get well over 400 ft. per month with a four-man crew in a six-day week, two shifts a day. The cycle is to muck out, drill off and blast on each shift. Best performance was obtained where two men, with two faces available, took two rounds each shift and made an advance of 382 ft. in a month. In this case, the mucking was done on the opposite shift.

Drifting Technique Better

MINE NO. 7, QUEBEC. The steel cost per foot of hole drilled with airleg drills and carbide-tipped steels is usually higher when using carbide tips than when using steel bits. But usually the feet-drilled-per-man-shift when using carbide greatly exceeds the footage for bits and for this reason the total cost (labor and materials) per foot of hole drilled when using carbide is often lower than when using steel bits.

Airleg drills have replaced bar-mounted drills for drilling in stopes. The former in many cases are using steel bits.

In most types of rock, the bar-mounted machine is preferable to the airleg-mounted drill for drifting. However, drifting technique using airlegs is improving.

No Airlegs for Big Mine

MINE NO. 8, MANITOBA. This large company did not share the earlier enthusiasm of eastern Canadian mines for the light airleg combination. The optimum application of this equipment, in the management's opinion, appears to have narrowed to mines where compressor capacity and air lines are inadequate for larger equipment, where the ground is soft and drilling speed with the light equipment is relatively high, where miners are readily adaptable to airleg operation, and where a well-equipped drill steel shop is not available.

The chief advantage of the airleg equipment is held here to lie in the ability to make rapid changes from hole to hole, or from breast to breast. Where the actual drilling time is a small proportion of the time spent at the face (i.e. generally in soft or medium ground), the airleg equipment can be used advantageously. The actual drilling speed of the light drill and airleg is much lower than that of heavier drills (3 in.-3½ in. bore) and to offset this, the speed of changing steels, or of aligning and collaring holes must be increased with the airleg equipment.

At this property the application of the airleg will probably be limited to slashing in drifts or raises, and to breasting in narrow stopes.

For straight drifting, the fastest actual drilling speed can be realized with 3½-in. drifters and carbide-tipped steel. This has become standard here for drifting and is no longer a trend. The drilling speed of this combination is 80% greater than the light 2½-in. bore hammer when both are using the same type of steel at the same air pressure. The handling time of the heavy drifters is long but this is decreased by the use of long

shell feeds and jumbo mounting. Both features, i.e. jumbos and long shells (4 to 6 ft. long), can be expected to find increasing application for drifting work here.

Although steel bits were used for half the drilling 12 months ago, very few of them are being used now.

Carbide-tipped steel made in the mine shops is being used for over 90% of all percussion drilling at this mine. Detachable carbide bits have given satisfactory performance but unless their cost is markedly reduced, it is improbable that they will find extensive use here.

Competition Brings Improvement

MINE NO. 9, ONTARIO. Opinion here is that the use of light airleg-mounted drills working with carbide-tipped forged steel appears to be on the increase still in Canada. From talks had with mining men from South Africa and Rhodesia, the same appears to be true in those countries.

There are several makes of drills on the market now and this competition has already led to improvements in design which have resulted in lowered maintenance charges. During the past summer, a French manufacturer was testing his company's machine in the mines of Ontario and northwestern Quebec.

At present a few mines are making their own tipped steel. Others are planning to do so. All of this gold operator's drilling, including development, is now done with this equipment.

Effect on Training

MINE NO. 10, QUEBEC. The trend to light Swedish drills and carbide-tipped steel has increased "all around," according to this company. All of its stoping is done with this equipment.

Since it no longer trains men on setting up of bars, etc., the company finds it difficult to engage development crews. It therefore has several drift faces using the same equipment. Use of the one-man machine has made it difficult to train machine men. Formerly, the helper learned to run the machine, but now the helper has become a scraperman slushing broken ore in the stope. Further, with a scarcity of trained machine men, the company has difficulty in finding raise men.

Standardize on Two Makes

MINE NO. 11, QUEBEC. During the last two years this company has changed its practice considerably. Airleg-mounted drills have replaced almost all bar and arm-mounted leyner drills, except in development headings. Even in drifts, airlegs are as efficient as leyners.

Tests have resulted in standardizing airleg-mounted drills in two makes: Copco's RH655W drill (52½ lb.) with Copco airleg (38 lb.), total weight 90½ lb. Also Canadian Ingersoll-Rand's J40 drill (60½ lb.) with Holman airleg (34¼ lb.). Both machines are used in drifting and flat-hole drilling. A new type of C.I.R. Jackleg is being tested.

Detachable bits are of three main types: Carbide-tipped four-wing; carbide-tipped chisel; and steel four-wing.

Carbide-tipped bits are used in all development headings and in stoping operations where the ground is hard and abrasive, while steel bits are employed for drilling soft ground.

Shank sizes are ⅞ in. quarter octagon and ⅞ in. hexagonal. Drifting is done either with airleg-mounted drills or automatic leyners with 48-in. aluminum shells mounted on bar and arm.

Raises and vertical holes are being driven with G-D.R94 stopers using steel or carbide-tipped bits.

At present, tests are in progress to compare results using carbide-tipped bits and sectional steel with bar and arm-mounted leyners, instead of using diamond drills for long-hole drilling in open stope development.

Overall Cost Better

MINE NO. 12, QUEBEC. Use of airleg drills with carbide-tipped forged steel has been increased 50% during 1952. The drill decided upon has been Holman's Silver Bullet, an airleg machine. The miners here seem to prefer the heavier and closed-chuck machine. Return has been made to ⅞-in. Q.O. steel from ⅞-in. hexagonal steel. The former is better, gives longer life in the chuck and has bigger cross-sectional area than the hexagonal steel for the same diameter of hole.

This company finds that the cost of drilling per ft. of hole drilled with carbide-tipped steel is twice that of using standard steel. This is offset by the greater number of holes drilled per shift and the use of only one man on the machine.

Air Consumption Lower

MINE NO. 13, QUEBEC. Since the Swedish method was introduced into Canada, this company has been using light equipment, has found it more efficient than conventional heavy equipment for shaft-sinking, drifting, crosscutting, raising and stope work. Generally, the light machine has given more advance per man-shift in development headings and more tons per man-shift in stopes.

Approximately 900,000 ft. has been drilled with the light equipment to date, the cost per foot of hole drilled competing with that obtained with detachable steel bits. Drill repair costs have been slightly higher than with leyners, but when the initial cost is considered, the light machines compare favorably.

A further point for the light machines and particularly so with the Swedish machine, perhaps, is the low air consumption. The operator can run more light machines on the same compressor capacity, or can operate the usual number at a cost saving.

This operator points out that practically every drill manufacturer in North America now supplies a drill for airleg-mounting. This has affected the further spread of the use of Swedish equipment. The result is that many operators now use the Coromant carbide-tipped drill steel with various light machines. There are also a number of manufacturers supplying carbide-tipped forged shanks to the industry. This indicates a definite swing to this equipment throughout the length of Canada.

Another interesting trend, which is becoming apparent in the Noranda area, is the swing to long holes drilled with extension steel, using leyner-type drills, according to the same operator. An increasing percentage of the latter's production rock is being broken by this method. He is using 3-in. machines fitted with water swivels and 1⅛-in. bits. Rods used are shanks of Swedish steel cut into 2 ft. 10 in. lengths. Outside diameter of couplings is 1⅜-in. The unusually small clearance between bit and coupling is possible, as the rock is not abrasive and is desirable in that it prolongs rod life and makes a straighter hole. Further, the hexagonal rods clear better than round rods when being pulled from the hole. Average length of hole is approximately 60 ft., though 70 ft. is common. Longest hole drilled to date was 105 ft. Drilling efficiency was found to decrease with holes over 70 ft. This may not be the case when heavier equipment is used.

Drill Package Wanted

MINE NO. 14, QUEBEC. This operator believes that tungsten-carbide-tipped steel is here to stay and will gain in popularity as inserts and equipment improve. He reasons that the rock in Ontario and Quebec and throughout the Precambrian is hard (and carbide is the answer to hard ground). The equipment is light and easier to handle, and it is easy to learn to run it. These advantages make for lower cost.

All development and most of the stope work at this mine are being done with tungsten carbide. Late in the summer the company was changing from diamond drills to 3½-in. air drills in long-hole stoping.

The Swedish company which introduced into Canada the combination of a light airleg-mounted machine and carbide-tipped steel gained a lead, according to this operator, because they were first in the fie'd. This year one manufacturer has brought out a machine which has been designed solely for use with carbide-tipped steel. Design of other machines is understood to be under way.

This operator evidently thinks it would be well for the drill manufacturers to offer a package of drill and tungsten-carbide tipped steel. In hard ground the solid steel is better than the detachable bit. A number of firms are already making up steel. The quality of the carbide insert is an im-

portant factor, especially where it is used in hard ground.

Several large mines are making up their steel and putting in the inserts themselves. Equipment to do this work is costly, and, more to the point, requires skilled supervision which is lacking in most mines. Even the making up of shanks for tungsten-carbide detachable bits requires more exacting workmanship than making up shanks for ordinary steel detachable bits if one is not to spoil too many of the tipped bits.

Mostly Airleg Units

MINE NO. 15, ONTARIO. At this gold mine, all drills, except two heavy jumbo-mounted power-feed leyner machines, are airleg-mounted units. Some are made by Atlas Diesel (Swedish) and the balance by Canadian Ingersoll-Rand. The company intends to use the airleg machines in all stope work and in new development headings. All are using ⅞-in. hex. steel having a carbide-tipped forged chisel bit and a collared shank. A few four-point carbide-tipped forged steels are in use. No detachable carbide bit has proved satisfactory so far. Carbide-tipped rods are sharpened by the drilling crews on portable grinders in the working places. No immediate change is planned.

Away from Airleg

MINE NO. 16, The trend at this mine is away from airleg-mounted drills and carbide-tipped forged steel to the use of jackhammers, leyners or stopers, and carbide-tipped four-wing detachable bits. Although the company is still using for about half of its tonnage a detachable four-wing multipass bit of modified Liddicoat design made in its own shops, the recent reduction in the price of the carbide bit which it prefers has influenced it in favor of using this bit more extensively. Greater use of lighter machines, particularly jackhammers, appears almost inevitable.

Those Participating

MINING COMPANIES and individuals contributing to this discussion (*not in the numerical order of the foregoing*) are:

Pamour Porcupine Mines, Ltd., D. E. G. Schmitt, mine superintendent.

Waite Amulet Mines, Ltd., T. E. Little, manager.

Senator-Rouyn, Ltd., I. G. Nelson, chief engineer.

Powell Rouyn Gold Mines, Ltd., J. E. Jerome, mine manager.

Noranda Mines, Ltd., N. J. Taylor, chief mine engineer.

Hollinger Consolidated Gold Mines, Ltd., E. A. Perry, assistant general superintendent.

Lamaque Mining Co., Ltd., J. C. Perry, general manager.

Lake Shore Mines, Ltd., J. C. Adamson, president.

Golden Manitou Mines, Ltd., S. A. J. Hopper, manager.

Beattie-Duquesne Mines, Ltd., George Soper, chief engineer.

Anacon Lead Mines, Ltd., Douglas Parent, manager.

Hudson Bay Mining and Smelting Co., Ltd., T. A. O'Hara, equipment engineer.

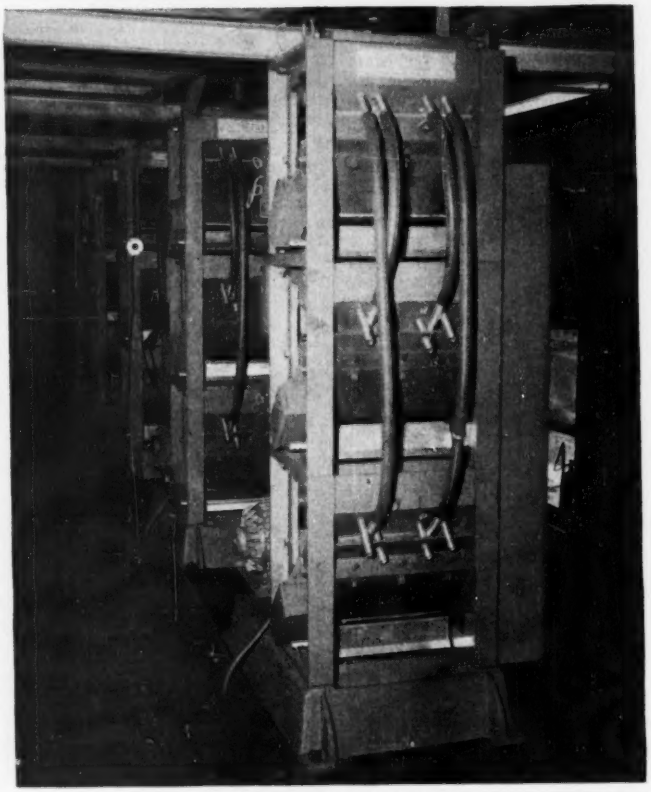
East Malartic Mines, Ltd., R. S. Haflidson, mine superintendent.

Belleterre Quebec Mines, Ltd., B. H. Budgeon, manager.

Eldorado Mining and Refining, Ltd., E. B. Gillanders, manager, mining and exploration.

Sigma Mines, Quebec, Ltd., J. B. Redpath, general manager.

Induced-Roll Magnetic Separators Now Recovering Staurolite, Formerly Wasted ➡



FIVE INDUCED-ROLL MAGNETIC SEPARATORS remove staurolite from tailings of ilmenite dry mill. Capacity is 3 tons per hour per separator.

Scoop Shovel Does Well in Tri-State Mine

EAGLE-PICHER INSTALLED a Thew-Lorain TL-25-J scoop shovel on trial at its Westside mine in Oklahoma some time ago (see *E&MJ*, Sept., 1952, p. 120). This shovel is working in a conventional Tri-State open stope in 30-ft. and 40-ft. ground having a large percentage of boulders in the muck. Up to early August, the loading results were:

Shifts operated (about 7 hours working time)	66
Tons loaded	38,200
Daily average	579
High run	890

As the machine is new, the operating costs are low and do not give a true picture, as no major repairs or replacements have been made.

For an equal tonnage and time period the shovel is showing better costs and output than competitive loaders. This is particularly true of pad and chain wear which is higher on the front-end type of loader.

The new scoop shovel is said to have made a good impression.

INSTALLATION of induced-roll magnetic separators at the Trail Ridge plant of Humphreys Gold Corp. near Starke, Fla., has made it possible to recover staurolite from the tailings of the ilmenite dry mill. The staurolite will be used as a source of aluminum and iron in making Portland cement at the new plant of the Lehigh Portland Cement Co. at Bunnell, Fla.

Heretofore, the tailings, composed of staurolite, zircon, and other silicate minerals, had been sent to the zircon plant where the zircon was recovered. The balance found its way into the tailings stockpile.

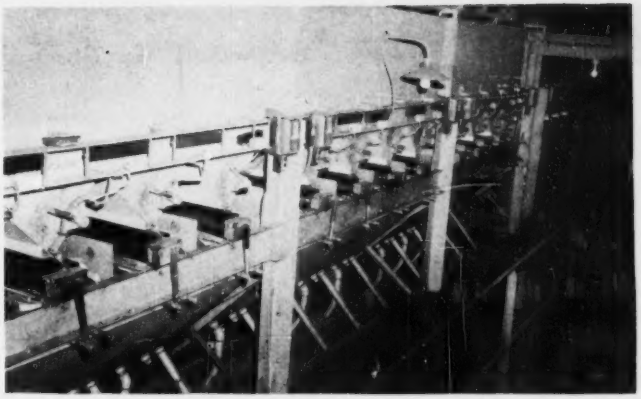
Five Carpco magnetic separators, built by Carpco Engineering & Manufacturing Co., Jacksonville, Fla., were installed in the ilmenite dry mill to treat the high tension separator tails after removal of the titanium minerals. The magnetic fraction will be a staurolite concentrate containing approximately 50% Al_2O_3.

Tailings from the ilmenite separators, of which approximately 30% is staurolite, go by elevator and conveyor to the five Carpco separators. The remaining 70%, the nonmagnetic fraction, goes to the zircon mill as before.

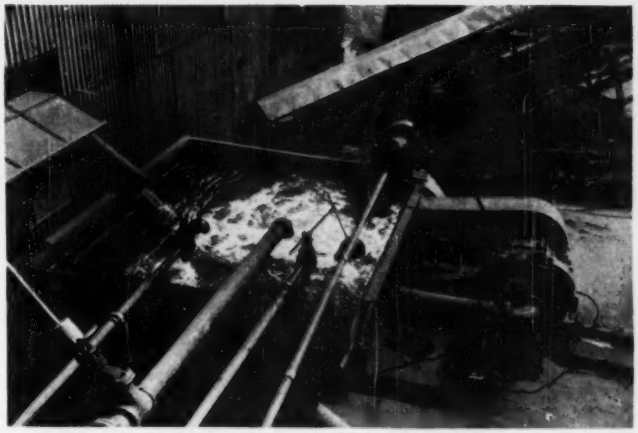
Each of the Carpco separators has a feed of 3 gross tons per hour. However, the feed from the ilmenite separators amounts to approximately 20 tons per hour, and that not going to the staurolite separators is by-passed and goes directly to the zircon mill.

While current production is sufficient to statisfy the present market demand, arrangements have been made for future expansion. The staurolite mill has a capacity of approximately 35,000 tons per year, although production schedules call for only 25,000 tons per year.

The staurolite from the magnetic separators goes by conveyor into a bin at the railroad siding and is loaded into gondola cars and shipped direct to the Lehigh plant.



TAILINGS OF MAGNETIC SEPARATORS in ilmenite dry mill are taken by conveyor belt to induced-roll magnetic separators



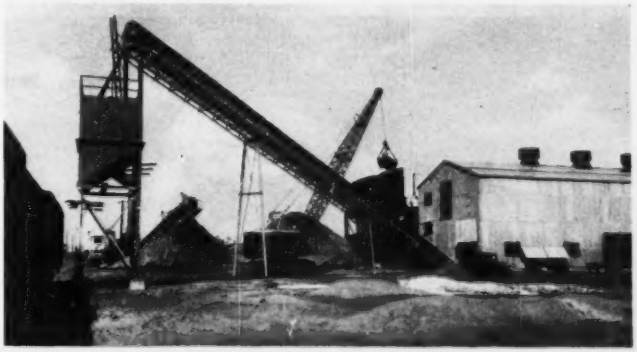
TAILINGS FROM STAUROLITE PROCESSING, with ilmenite tailings which by-passed staurolite separators, go from here to zircon recovery.

Briefs

American Zinc Company, Mascot, Tenn. is experimenting with carbide-tipped forged drill steel. A Kennametal milling machine has been purchased and tipped rods are being made for one of its mines, using carbide inserts also from Kennametal. The management is pleased with the cost of the homemade insert bits.

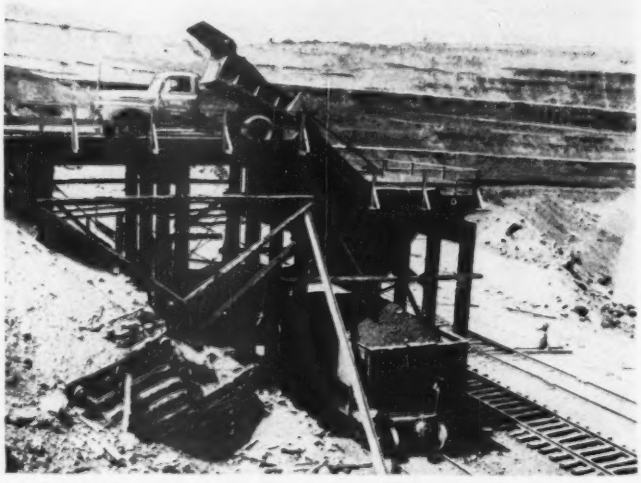
A 500-hp., wound-rotor, 600-rpm, direct-connected motor is spoken of as the drive selected for the 60-in. gyratory being built for crushing Mesabi taconite at the mine before shipping for beneficiation. Consideration is also being given to use of two 500-hp. motors coupled to either end of drive shaft for peak load. Synchronous motors are also being considered.

(Keeping Tab continued on p. 110)

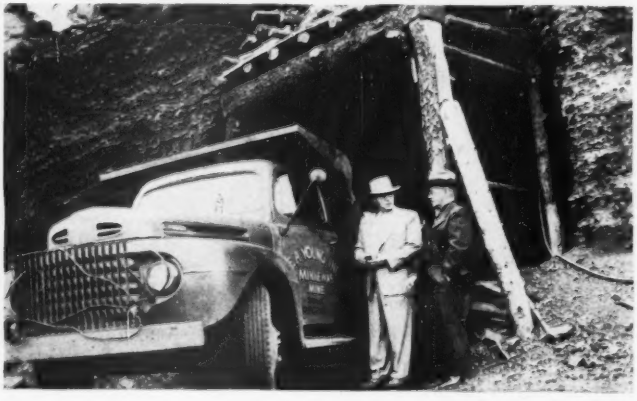


STAUROLITE RECOVERED from tailings of ilmenite dry mill goes by conveyor belt to this storage hopper for shipment by railroad.

LOADING E. A. Young's trucks in Minnewas mine on Mesabi. Trucks are equipped with two-speed axles.



DUMPING ORE into hopper at railroad ramp. Round-trip distance between shovel and ramp is approximately half a mile.



ORE IS ALSO MINED underground and loaded into trucks (by conveyor) at point 400 ft. in drift from entrance. E. A. Young is standing next to car.

Two-Speed Axles Have Advantages on Highway Trucks

SPEED FOR HAULING on the highway plus ability to pull heavy loads through mud and sand and under other rough conditions are advantages claimed by various mining companies for the two-speed axles they are using on trucks built for highway work. (Eaton Mfg. Co., Cleveland, Ohio.) The double number of gear ratios provided make this possible. With the high-range gears the driver can choose one that will give greater speed on the highway with less work for the engine on level runs and on hills. The low range permits use of a gear that will provide him with more power when needed to bring him through tough places. In this way, it is asserted, the load is geared to the road. Truck operation becomes more flexible.

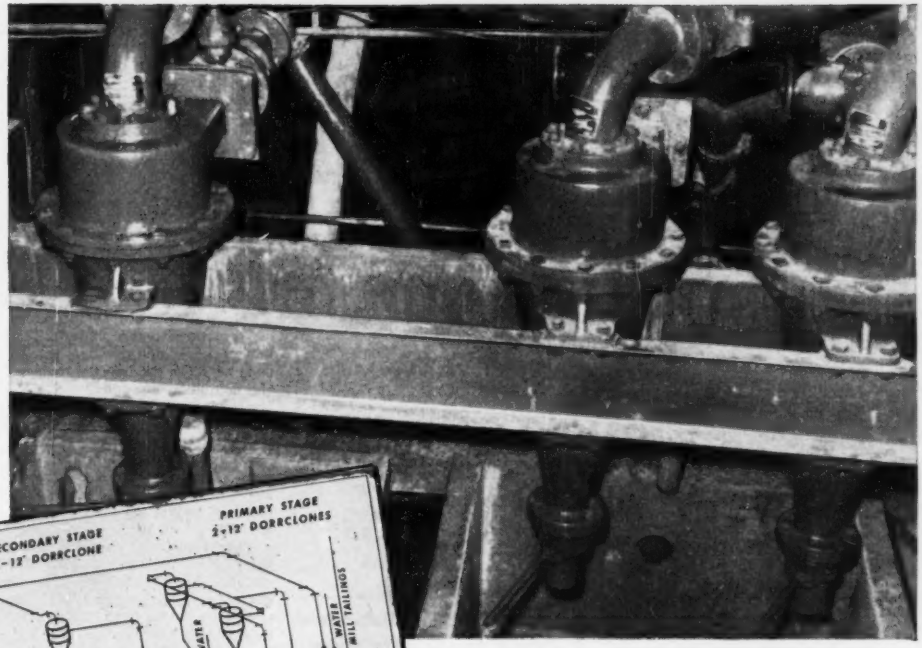
Summarized, the advantages spell saving in time and gas, with fewer repairs, giving lower hauling costs. Operation also is safer because the driver has better control over his truck.

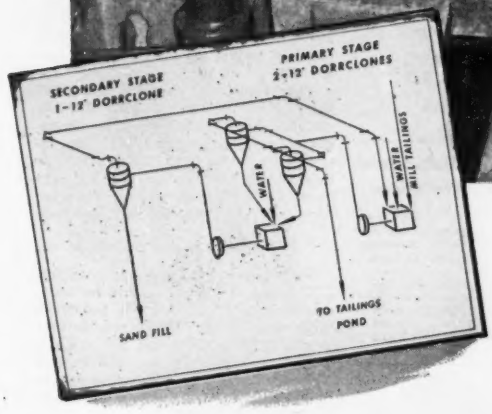
One Iron Country operator, having miles of power lines in eight mines to maintain, needed a repair truck that could go anywhere and get to spots quickly where trouble cropped up. This need was met by equipping the company's emergency repair truck with the two-speed axles.

E. A. Young, Inc., iron ore operators of Hibbing, Minn., have eight F-8 and two F-6 Ford trucks equipped with these axles in the Minnewas mine, at Virginia, Minn., on the Mesabi. Satisfactory experience is reported. The trucks are used throughout the season on both mining and stripping. In 1952, it is estimated they will have moved 60,000 tons of ore, 75,000 cu. yd. of rock stripping and 70,000 cu. yd. of dirt. The tonnage that is hauled daily varies from 1200 to 2000.

The trucks work entirely within pit limits hauling ore from shovel to loading ramp, a round trip of half a mile, and carrying rock and dirt that has been stripped to the stockpiles. The grade from shovel to ramp varies from 5 to 20%. The trucks also haul underground ore which is delivered to them by underground conveyor in a 14x14-ft. drift, 400 ft. in from the mouth of the drift.

(Keeping Tab on Practice is continued on p. 112)





For Producing Mine Backfill From Mill Tailings...

Madsen Red Lake Gold Mines uses two stages of DorrClones for maximum flexibility*

From a 3" test DorrClone to the installation of three 12" dia. units. That's the story at Madsen Red Lake, one of Canada's most modern gold producers. Using a two-stage flowsheet as shown in the accompanying sketch, the DorrClones are producing 120 tons per day of fill with a percolation rate of 4-6 in/hr.

Key to this two-stage DorrClone setup is flexibility. While the units are in continuous operation, simple adjustments can be made to produce any type of fill from practically any composition of mill tailings. To illustrate this flexibility, three tests were made at Madsen Red Lake yielding the following results:

*T.M. Reg. U. S. Pat. Off.

	TEST A	TEST B	TEST C
New feed to primary stage, TPD	330	298	330
% solids to DorrClones	.....	21.2	21.4
Sand Fill Produced, TPD	251	167	120
% solids	49.5	57.0	62.5
Percolation rate, in. per hr.	2.75	6.75	11.5

(Tests were made consecutively without shut-down)

Regardless of your particular mining operation, tailings composition or fill requirements, The DorrClone is an ideal tool with which to solve backfill problems. Write for a copy of bulletin No. 2500 to The Dorr Company, Stamford, Conn., or in Canada, to The Dorr Company, 80 Richmond Street West, Toronto 1.

Better tools TODAY to meet tomorrow's demand

DORR

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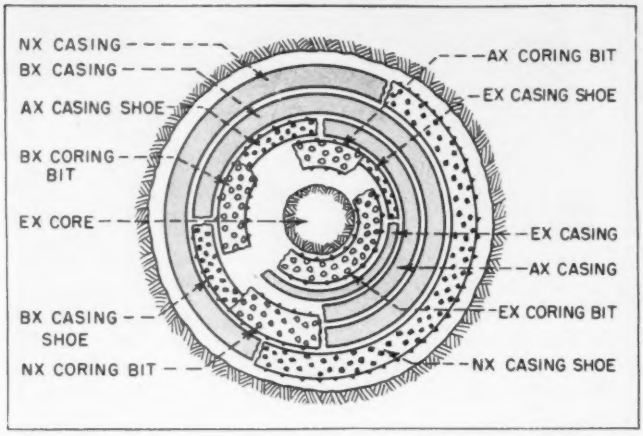


Standards Up to Date for Diamond Core Drill Fittings*

HARRY A. KURTZE
E. J. Longyear Co.
Minneapolis, Minn.

SIX SIZES of diamond drill bits were most commonly used prior to 1929. They were listed as ES, E Mesabi, E, A, B, N, and ranged in size from $1\frac{7}{16}$ in. to $2\frac{25}{32}$ in. outside diameter. These sizes, however, were not related to each other as far as casing requirements were concerned.

The necessity for standards was recognized by mining men and by the diamond-drilling industry more than 20 years ago. The Diamond Core Drill Manufacturers Association held its first meeting on May 27, 1929.

Standards were adopted which permitted the setting of four nested strings of casing without the need of reaming. The National Bureau of Standards of the United States Department of Commerce published the Commercial Standards on Diamond Core Drill fittings as CS17-30 in 1930. Revised editions of the standards (CS17-32, CS17-42, CS17-47) were published in 1932, 1942 and 1947, respectively.

The first commercial standards reduced the number of bits and casings to four. This system permitted four casings to nest one within the other.

The standards published in 1930, 1932 and 1947 covered drill rods and couplings in E, A, B, and N sizes; blank bits, casing and casing couplings in the EX, AX, BX and NX sizes.

The 1942 standards included two new sizes—EXT and AXT, the "T" in the designation indicating "thin-wall bit." Due to World War II, the 1942 standards were never put into effect.

Nominal Dimensions Important to Proper Nesting Procedure

	Casing O.D.	Casing Coupling I.D.	Casing Shoe I.D.	Set Core Barrel-Reaming Shell
	IN.	IN.	I.N.	IN.
NX	3.500	3.000	2.995	2.980
BX	2.875	2.375	2.375	2.360
AX	2.250	1.906	1.905	1.890
EX	1.812	1.500	1.500	1.485

Standards Today

The old standards for the E, A, B and N drill rods and couplings which prevailed before 1929 still exist. They form part of the standards in the new Bulletin No. 1 of the DCDMA. It will be of interest to note that the outside diameters for the four sizes of rods correspond approximately to the outside diameters of standard 1-, $1\frac{1}{4}$-, $1\frac{1}{2}$- and 2-in. pipe.

Considerable progress has been made in broadening the range of these standards. The new "X" Series standards cover blank core bits, casings and casing couplings. They also include set core bits, set reaming shells, core lifters, blank and set casing bits and casing shoes, and set casing reaming shells.

The inclusion of set bits and shells is of utmost importance. It assures the customer of a trouble-free nesting procedure which is described further in this article, in the novel, composite sectional view at the left.

"X" series core barrels are grouped into single-tube, double-tube rigid-type, and double-tube swivel-type barrels. At present only the set core bits, set reaming shells, and core lifters at the lower end of these barrels are covered by the standards.

The "M" Series Barrel

In addition, a new improved swivel-type double-tube core barrel, the "M" Series barrel, is also listed. All of its parts except for the internal construction of the head, are standardized in EXM, AXM, BXM and NXM sizes.

Core barrels larger than NX size have been used increasingly. Acceptance of these standards resulted from the combined efforts of the A.I.M.E., the Corps of Engineers, the Bureau of Reclamation, the Bureau of Mines, the mining and construction industries, and the manufacturers. The barrels covered by these new standards are called the "Large Series" ball-bearing, swivel type, double-tube core barrels.

This series of barrels comprises three sizes, the $2\frac{3}{4}$ x $3\frac{7}{8}$, the 4 x $5\frac{1}{2}$, and the 6 x $7\frac{3}{4}$ barrels. The dimensional designations indicate the approximate core and hole sizes in inches. For instance, the 4 x $5\frac{1}{2}$ core barrel will recover a 4-in. diameter core and drill a $5\frac{1}{2}$-in. diameter hole.

Five Steps in Nesting

Step 1. As shown in the illustration, NX casing, $3\frac{1}{2}$ in. O.D., can be set in a hole made by a $2\frac{3}{4}$ x $3\frac{7}{8}$ barrel, or by a suitable bit. If desired, it may be advanced with casing bit or shoe.

Step 2. Inside of the NX casing, NX core barrels or BX casing can be run. BX casing will enter a hole made by NX core barrels.

Step 3. Inside of the BX casing, BX core barrels, or AX casing can be run. AX casing will enter a hole made by BX core barrels.

Step 4. Inside of the AX casing, AX core barrels or EX casing can be run. EX casing will enter a hole made by AX core barrels.

Step 5. Inside of the EX casing, EX core barrels can be run to complete the hole.

Unless conditions require it, the use of the five outlined steps is not necessary in all cases. In shallower holes, or in good ground, a hole may be completed without reduction in size of fittings.

Good Housekeeping

SEVERAL TRACK-CLEANING machines are reported by American Mine Door Co. to be in service in underground iron mines in the Michigan Iron Country. These machines are designed to keep the haulage ways free of spilled iron ore, thereby preventing derailments. The value of the ore fines thus recovered may be credited against the first cost.

* A letter-size booklet of 12 pages dealing with standards for diamond core-drill fittings has been published by the Diamond Core Drill Manufacturers Association, 122 E. 42nd St., New York. It is designated as "Standards of the Diamond Core Drill Manufacturers Association—Bulletin No. 1."

INDUSTRY'S ALL-TIME FAVORITE FOR LONG RANGE *Economy*

JENKINS
Fig. 106-A
Renewable
Composition Disc

BRONZE
GLOBE VALVE

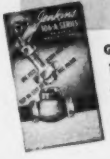
150 lbs. Steam
200 lbs. O.W.G.

Take a Jenkins Fig. 106-A apart. It's easy to see why it is industry's all-time favorite. Note the liberal dimensions of body and bonnet casting — the heavy, manganese bronze spindle, with more strong threads in contact with the bonnet, regardless of spindle position. See how the slip-on, stay-on disc holder fully protects the edge of the disc, prevents creeping, flaking, or cracking.

Every part, from perfect grip, heatproof handwheel to pipe ends, reflects the designing skill of Jenkins valve *specialists.* There's a good reason. Jenkins Bros. introduced the *first* renewable composition disc valve, — is today the only manufacturer of both valves *and* discs.

Fig. 106-A not only looks better — it proves out better in performance. In any comparison, its long life, low upkeep record has never been surpassed. That is the true measure of valve cost — and it is the reason why industry's shrewdest buyers will settle for nothing less than Fig. 106-A quality.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros.



GET THIS FOLDER — Gives details of Fig. 106-A design, and "family" interchangeability. Ask your Jenkins Distributor for Form 189-A, or write Jenkins Bros., 100 Park Ave., New York 17.

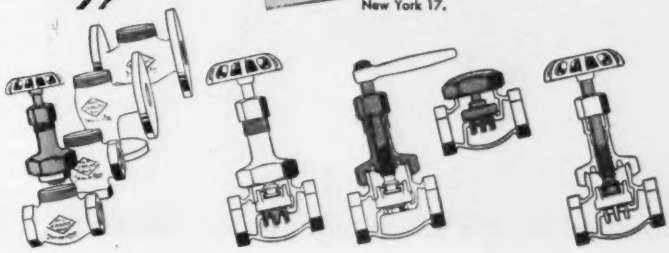


Fig. 106-A "Family" interchangeability meets 90% of your valve needs with a small inventory of parts. Start with the standard Fig. 106-A. Trimming is interchangeable in Globe or Angle body, screwed or flanged. With a few parts, quickly-assembled combinations provide a Lift Check, a Spring-loaded Check, and valves for Stop and Check, Quick-opening, or Throttling service.

OPERATING IDEAS

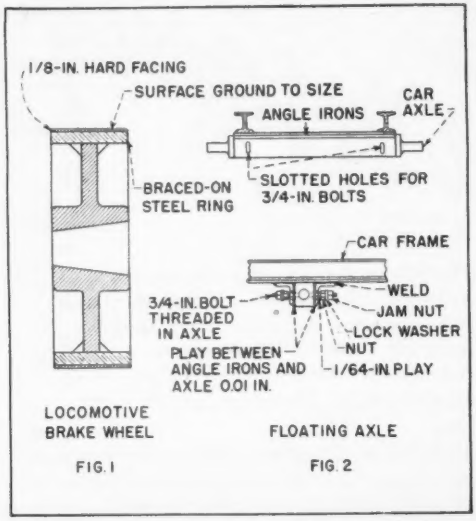


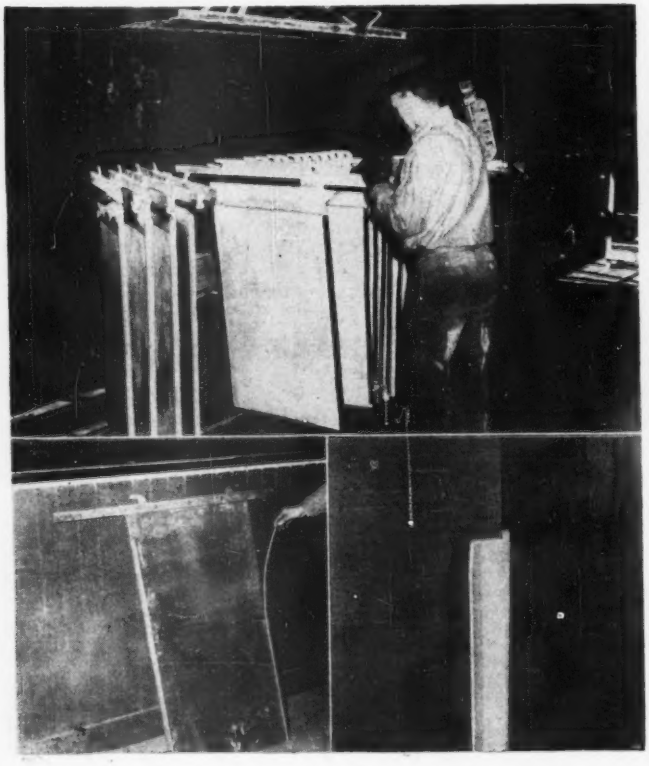
FIG. 1 FIG. 2

For Lower Haulage Costs—Try These

PHIL KEAST, master mechanic, Empire Star Mines Co., Ltd., Grass Valley, Calif. submits these two cost-cutting ideas for haulage systems:

1. Originally, cast-iron brake wheels on electric locomotives at the mine lasted less than one month. To remedy this difficulty, the worn rim was turned off in the latne, and a hard-faced steel ring braced in its stead, and ground to size. The layer of hard-facing is ⅛ in. thick. The wheels thus modified as shown in Fig. 1 have been in operation more than six months and show little wear.

2. Mine cars with wheel axles held rigidly on the car frame frequently left the track when running over uneven track. This was overcome by welding two angle irons with slotted holes to the car frame and providing the axles with shallow threaded holes to accommodate ¾-in. bolts fitted with nut, lock washer, and jam nuts as in Fig. 2. The space between the angle irons is about 0.010 in. wider than the width of the axle, and bolts are set with 1/64-in. play between the wall of the angle iron and the nut. The axle "floats," and the wheels stay on the track.

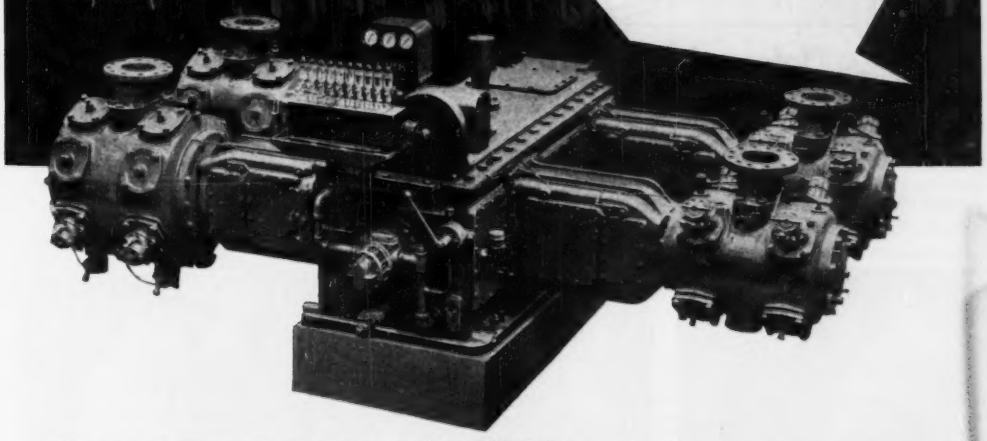


Faster Cathode Stripping

DEVELOPMENT OF AN improved stripping device for removal of electrically deposited zinc from cathodes has been revealed by Anaconda Copper Mining Co. In Anaconda's Great Falls, Mont. plant, zinc is deposited on aluminum cathodes. Every 24 hours these cathodes are gang-lifted by electric hoists to stripping racks where zinc deposits are removed from the aluminum cathodes. To facilitate stripping of the zinc deposits, it has been the practice to fit a grooved wooden stick on each vertical edge of the cathode. Separation of the zinc deposit along the vertical edge permits easy removal of the zinc from the aluminum. However, wood broke easily and was attacked by acid. So Anaconda engineers designed a channel shape with special projections which was extruded in Aeroflex (polyethylene) by Anchor Plastics Co., New York, to specifications.

Although costing several times as much as wood, these strips resist acid, do not break, and have served so effectively that they have replaced all wooden strips in the plant. Photos at left show channel-shaped plastic strips in use.

modernize with a truly modern compressor



For your air compressor requirements in the 150-4500 bhp range, no compressor today . . . *no compressor in history* . . . can match the distinct advantages of the Clark Balanced/Opposed, Motor-Driven line.

Truly modern in every respect, it embodies only well established design principles. Thoroughly performance-proved in the toughest kinds of service, Clark Balanced/Opposed units represent the most outstanding industrial air compressor development of our times. Their features and benefits in installation, operation and maintenance are unrivaled.

Obtain *all* the facts today on the complete Clark Balanced/Opposed Compressor line available in 2, 4 and 6 cylinder sizes; 8, 14 and 17" stroke; 150-4500 bhp. Request Bulletin 118.

- *Perfect balance for vibration-free performance.*
- *Space-saving, single unit crankcase*
- *Minimum foundation.*
- *Absence of complex field alignment.*
- *More horsepower in less floorspace.*
- *Rugged, precision construction.*
- *New simplicity and accessibility.*
- *Operated with any kind of drive.*

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OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

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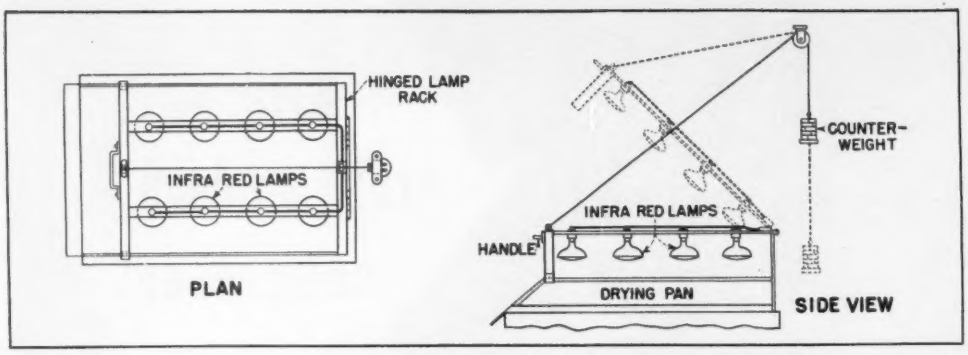
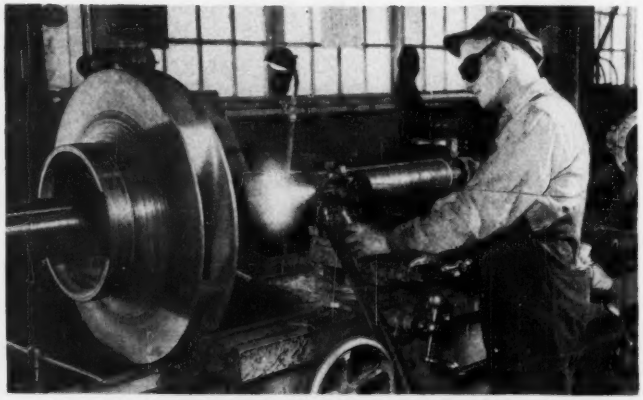
Midget Angle • Right Angle • Big Angle • Electric-Driven • Centrifugal



Infrared Lamps Dry–Heat Concentrates

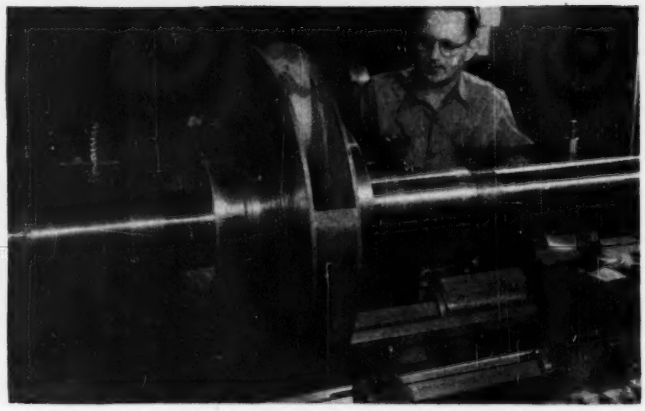
TUNGSTEN FLOTATION concentrates produced in Getchell Mine, Inc.'s new acid leaching plant are dried with the infrared unit shown here. This method has proved more satisfactory than wood or oil-fired units found at some mills.

The drier consists of a pan made of sheet steel resting on a concrete foundation and an overhead steel rack containing eight infrared lamps. The rack is hinged and may be raised or lowered easily with the cable-counterweight attachment shown. Because of the simple design, the drier can be made at low cost in average mine shops.



How Metal Spraying Cuts Repair Bills

METAL SPRAYING offers two advantages according to H. W. Bayley of Consolidated Mining and Smelting Company of Canada, Ltd. First, it's a quick and inexpensive repair, and second, a metal can be chosen for the spray coating to give the best service for operating conditions. This set of photographs shows a worn sleeve of an 8,000-gpm centrifugal pump (above) which was sprayed with stainless steel (upper right), and machined down to fine serviceable condition (lower right).



throughout the vast, rich challenging north country

development

FOLLOWS THE DIAMOND DRILLER

He's the first man in. Nothing is proved—no blueprints can be drawn until his findings are in your hands. And that's our job! Year by year, Boyles Bros. drilling crews are opening up the North. Our entire manufacturing and servicing facilities are geared to support these hand-picked teams in every phase of exploratory work. For example:

AT ATIKOKAN, ONTARIO.

Boyles Bros. diamond drills and crews have played an important part in the development of the Steep Rock iron ore property. Beginning with the construction of the drainage diversion canal in 1943, our crews have continued to supply vital information by exploratory drilling in the blocking out of ore bodies for Steep Rock, Claland Ore Co. and others. They are still engaged on this work as each new ore body is brought into production.

AT WALLEACH LAKE, B. C.

Here, the British Columbia Electric Co. Ltd. is engaged on a hydro electric expansion program. Boyles Bros. crews have handled all diamond drilling for the tunnel, dam site and attendant grouting problems encountered on the project. In the near future, the turbines will be producing additional kilowatts for industrial and domestic consumption on the lower B.C. mainland.

EQUIPMENT
EXPERIENCE
EFFICIENCY

THESE THREE WORK CONSTANTLY FOR YOU ON EVERY CONTRACT JOB WE DO.

WE LOOK INTO THE EARTH

BOYLES BROS
DRILLING COMPANY LTD.,
VANCOUVER, CANADA

Who Will Supply Power for Processing Taconite *(Continued from page 103)*

The Aurora power plant is described by F. S. Rice and Hubbell Carpenter, respectively chief engineer and assistant chief engineer of the Minnesota Power and Light Co., at Duluth, in the Dec. 1 issue of *Electrical World* (McGraw-Hill). Messrs. Rice and Carpenter say that outdoor and semi-outdoor plants are not unusual in some southern climes, but that further north they have been the exception rather than the rule. Today, however, more and more northern companies are venturing experimentally in this direction in search of the same savings in building costs that have been realized in the south.

Continuing, the following is excerpted or condensed from the article:

The new Aurora station (see photo on p. 103), now under construction on a natural peninsula on Colby Lake 65 mi. north of Duluth, is a recent example of semi-outdoor construction in sub-zero country. All of the station's equipment is housed except the boilers. They are enclosed on the firing aisle, around the drums, induced draft fans and circulating water pumps.

Mesabi Power Load Growing

The station site, on the eastern end of the Mesabi, is near the company's rapidly growing iron mining load and also near an adequate condensing water supply.

Initial construction includes two 44,000-kw. preferred standard units. Substantial capacity can be added when and as needed.

The plant is designed basically for pulverized coal, to be shipped by rail from upper lake ports. Provision is also being made for burning either oil or gas.

Miniature control boards, as developed by Ebasco Services, Inc., in conjunction with manufacturers, will combine all the usual gages and controls normally found on the turbine and boiler gage boards and will be located in a centralized control room. A boiler firing aisle cubicle will be installed at each boiler for the purpose of transmitting boiler conditions to the control room and also making certain that this information is available at the boiler.

A complete automatic combustion control system will be used with centralized controls located on the miniature control board in the centralized control room.

The coal storage area east of the plant on the tip of the peninsula, is large enough to store over 200,000 tons. Equipment to be used for coal handling consists of a 45-ton diesel-electric locomotive, a bulldozer with a 27½-cu. yd. Carryall and a 5-ton car shaker.

Equipment Data—Aurora Station

Boilers, number	2
Boiler rating, lb./hr.	425,000
Throttle pressure, temp.	1,250 psi, 950F
Turbo-generators, units	2
Turbo-generators, rating	40,000/44,000 Kw. ASME-AIEE
Generator, nominal rating	47,058 kva 85% pf at 0.5 psig hydrogen
	58,822 kva 85% pf at 30 psig hydrogen
Condensers (2), rating	25,000 sq.-ft.surface
	280,000,000 Btu/hr.
Circulating water pumps (2), rating	@ 25 ft. total head 46,500 gpm
Transformers	2/unit 25,000 kva
Circuit breaker, oil	1/unit 110-kva
Auxiliary transformers	3,750 kva
	13,800/2,400 v.

Inching to Keep Belts From Freezing to Rollers

From the track hopper a double-feeder supplies an inclined belt conveyor which delivers fuel to a crusher house. Here is located an automatic sampler, crusher, and equipment to transfer coal either to the bunkers or storage. A Weightometer is installed on the belt for weighing while conveying.

To keep the belts that handle coal from freezing to rollers in extreme weather, they are kept in motion by an inching arrangement when not handling coal.

A pneumatic system will remove and store ash. A 200-ton glazed-tile, ash-storage bin has been provided. All vacuum-inducing and dust-separating equipment is mounted on top of the bin. A dustless unloader is located under the silo.

The cooling water intake structure, located on the south side of the peninsula, is composed of two bays, each containing a trash rack, two fine screens, and a circulating water pump. The pumps will be exposed to the weather.

A sealed concrete discharge structure is located on the north side of the peninsula, some distance from the intake. Each pump discharges into a pressure system for each individual unit. Piping is of reinforced concrete lock-joint design. A pressure recirculating system to minimize condensate refrigeration and freezing in front of intake, is handled by restricting flow at the discharge structure.

Each turbine-generator is an ASME-AIEE preferred standard 40,000-kw. unit rated at 44,000 kw. maximum turbine capability when operating at 1,250 psi and 950 deg. F. Each has a direct-driven exciter and pilot exciter. A start-up panel is to be located at the turbine end with gages to indicate pertinent turbine conditions.

The two 25,000-kva main transformers for each generator are located near the north side of the building and have a 110-kv. oil circuit breaker on their "high" side. General potential transformers will be mounted in the building. A neutral reactor will also be installed.

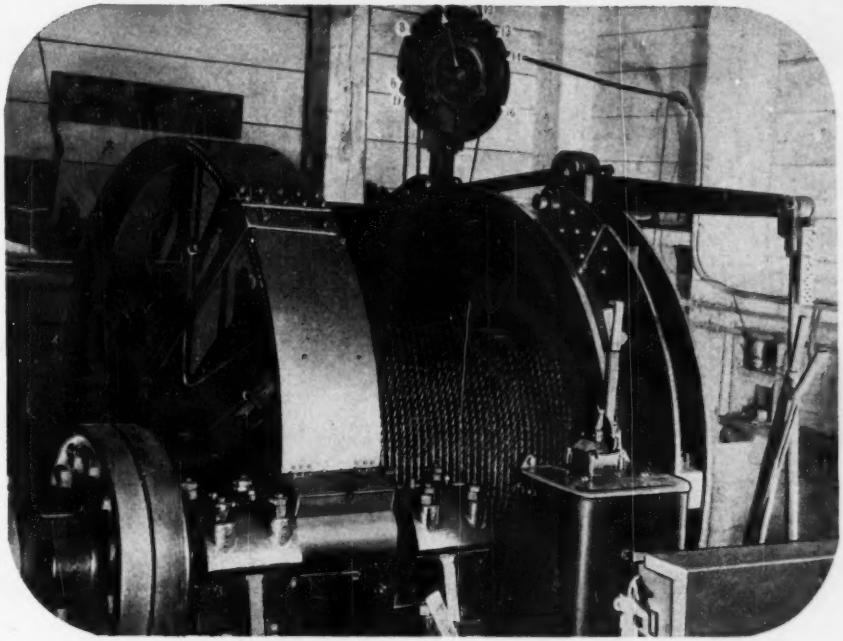
Generator controls will be combined with the boiler turbine controls in the centralized control room. High-tension lines, two 110 kv. and two 44 kv., will be controlled from this room.

Power for auxiliaries is to be supplied through unit 3,750-kva three-phase 13.8-2.4 kv. transformers connected directly to generator leads. Two 2,000-kva three-phase transformers will be provided to supply 2,400-v. standby from the 44-kv. switch yard.

The station auxiliary electrical system will follow the unit basis of the main plant equipment. This will consist of a group of metal clad switchgear, rated 5,000-v., 110,000-kva interrupting capacity for each unit. Interrupting capacity is based on two main units not being operated in parallel through the standby auxiliary source for any length of time.

Building equipment includes a 30-ton traveling crane and a packaged heating boiler unit designed to keep the plant at 45 deg. F. when outdoor temperature is —20 deg. F. Normally, with the plant in operation, saturated steam will be taken from the large boilers to supply space heaters.

WIRE ROPE



This is the longest-lasting rope we've ever made for mining

JUST MENTION wire rope and most everyone thinks of Roebling. For one thing, Roebling made the first wire rope in America. But what's more, we've always led in developing better wire rope for the needs of every branch of industry.

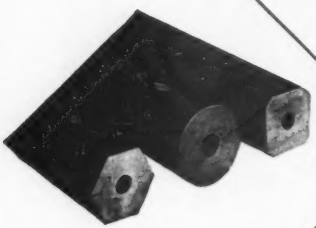
Roebling Preformed "Blue Center" Steel Wire Rope is today's best bet for mining service. It's safe, dependable and stands up under rough going. It saves you time and cuts costs.

There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, N. J.

CA



NEW

CRUCIBLE DOUBLE DIAMOND takes drill steel out of the "CROWBAR CLASS"

this Alloy Hollow Drill Steel has greater fatigue strength... cuts bit losses... lasts longer

At last! A drill steel that's not in the "crowbar class" . . . because Crucible's new DOUBLE DIAMOND hollow drill steel is a *tool* steel . . . made by drill steel specialists to tool steel specifications. Its greater fatigue strength means lower cost per foot drilled . . . and saves those *valuable carbide bits.*

Find out first hand about this step forward in drill steel — find out how Crucible DOUBLE DIAMOND in your drilling operation does a better job . . . faster! Write for full details. Do it now!

CRUCIBLE first name in special purpose steels

52 *years of Fine steelmaking*

HOLLOW DRILL STEEL

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

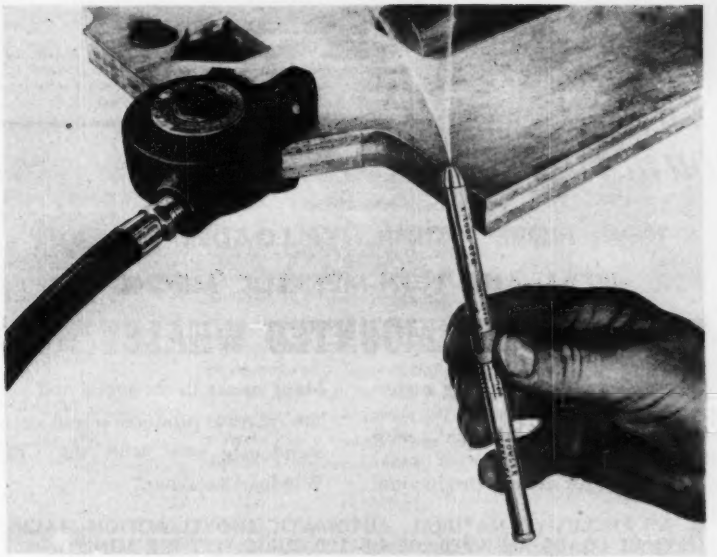
E & M J

NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

FEATURE

Inexpensive, Pocket-Size Gadget Measures Machine Vibration (1)



A POCKET-SIZE INSTRUMENT for accurately measuring the speed and amplitude of vibration on machinery or on bins and hoppers where vibration is produced intentionally to aid materials movement, is now available to the industrial field at the price of a fountain pen.

Martin Engineering Co., Kewanee, Ill., has been given sales franchises for the new vibration "slide rule" called the Fowler "Vibra-Tak."

The Vibra-Tak is only 6¼ in. long. It has a movable tuning slide that indicates on a number scale the speed of vibration. To operate the Vibra-Tak, you place the bullet nose against the vibrating object and move the tuning slide up and down the scale until the wire reed, which extends out of the nose as the slide is moved, reaches the maximum "throw." Then you simply multiply the scale reading by 1,000 to get the vibration in cycles per minute, or shaft speed in rpm. The arc through which the reed "throws" is in direct proportion to amplitude. It has a range of 2,000 to 15,000 cpm. Higher speeds register and can be closely estimated with reasonable accuracy.

Uses for the Vibra-Tak include: Finding vibrations per minute; checking rpm of high speed machines, if vibration is present; indicating the amount of vibration you get on bins and hoppers where vibrators are installed to aid in moving sand, grain, chemicals, food products, feed, cement, ground rock and other materials that resist motion toward the outlets of hoppers, bins, pipes or chutes. The Vibra-Tak reveals "dead" spots on equipment where vibration is induced and also aids in the locating of unwanted vibration on other equipment.

Vibra-Tak is priced at $3. (1)

The Whaley "Automat," with its strong armed shovel head and concentrated steel construction, takes such punishment as tunnel work and iron ore loading in its stride. Here is a Crawler Mounted Automat in operation in an Iron Ore Mine. Note the clean floor left by the machine.

Announcing . . .

A NEW, MORE PRODUCTIVE LOADER FOR METAL AND NON-METALLIC MINING

—THE CRAWLER MOUNTED WHALEY AUTOMAT

For the first time in 44 years of building underground loading machines exclusively, we now are equipping the Whaley "Automat" with crawler mounting to meet the needs of metal and non-metallic mining for greater production.

Many mines in the metal and non-metallic field can increase production and cut down-time tremendously now with the Crawler Mounted Whaley "Automat."

★ **AN EXCLUSIVE, NATURAL, AUTOMATIC SHOVEL ACTION MACHINE THAT LOADS AN AVERAGE OF 120 CUBIC FEET PER MINUTE.**

★ **CLEANS UP A WIDTH OF 24 FEET FROM ONLY ONE SETTING OF CRAWLERS . . . RESULTING IN MINIMUM DISTURBANCES OF BOTTOM.**

★ **A POWERFUL LOADER RECOGNIZED FOR ITS MECHANICAL ENDURANCE . . . ITS BUILT-IN ABILITY TO STAY ON THE JOB LONGER — LOADING CONSISTENTLY DAY-IN AND DAY-OUT.**

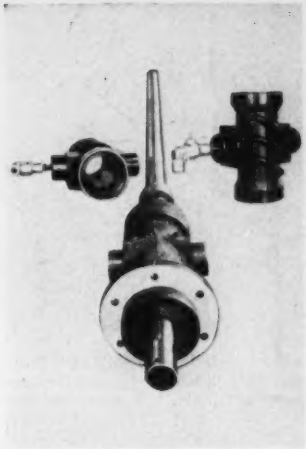
In addition, other features eliminate unnecessary and costly delays that slow down production. These features include complete hydraulic control . . . swing of the front end of the machine from side to side . . . the swing of the rear conveyor from side to side . . . the vertical adjustment of both the loading head and of the rear conveyor . . . the two speed drive to the propelling mechanism . . . the power driven spooling reel and automatic lubrication system.

For detail drawings, illustrations and description of the Crawler Mounted "Automat" Loaders, send for our Folder No. 2015. And, by the way, ask about the new companion equipment to the Crawler Mounted "Automat" . . . the newly developed Whaley Crawler Mounted Transfer Car! Myers-Whaley Company, Knoxville, Tenn.

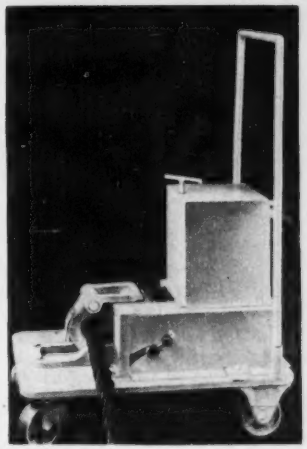
MYERS-WHALEY COMPANY

MECHANICAL LOADERS EXCLUSIVELY SINCE 1908

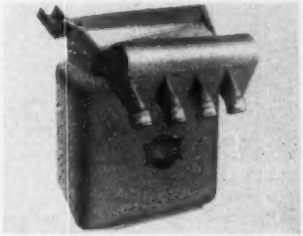
CHAIN HOIST with ratchet-lever uses coil instead of roller chain to permit chain to swing or wrap easily in any direction. 1,500 and 3,000-lb. capacities. Coffing Hoist Co. (2)



SCREW AND NUT ASSEMBLY for tilting furnaces offers much longer life because of ball-bearing arrangement than present conventional units. Made by Whiting Corp. (3)



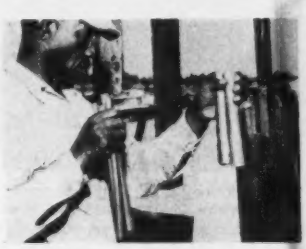
WIRE ROPE CUTTER, Hydrashear, is electric-motor driven and will cut up to and including 1¾-in. wire rope in 20 seconds. No special wiring is required. Pell Cable Cutter Co. (4)



LAB-SIZE SEPARATOR weighs less than 100 lb., measures 22 x 25½ in. Uses air-flotation principle to effect gravity separation. Sutton Steele & Steele, Inc. (5)

Concrete Floor Patch

Patched concrete floors can be used almost immediately when repaired with Superset Tampatch, according to United Laboratories, Inc., the manufacturer. All that is needed is to clean and bond the surface to be patched, dump in the required material, and tamp firmly into place. The patched area may be used almost immediately and will "withstand extremely heavy loads." When kept in airtight containers, material will keep indefinitely. (6)



SPACERS in blasting operations, made of plastic, are reported to reduce dynamite consumption but maintain effective breaking. Irvington Varnish and Insulator Co., Irvington, N. J. (7)

Computing Service

If you are being pressed by some knotty mathematical problems, Mathematical Computing Service, Brooklyn, N. Y., may have the answer for you. They specialize in engineering calculations, charts and monographs of a high degree of complexity and are ready to handle problems in the field of mining engineering. Important function of the group is the mathematical formulation of and solution of a problem from given physical data. The staff consists of consultants holding doctorates in applied mathematics. For further information, circle No. 8 on card. (8)

BUGGY is wheelbarrow-base type for easy transportation of your engine-generator set. Trade-named Speedy-Shift, it can be detached from generator in few minutes. Wincharger Corp. (9)

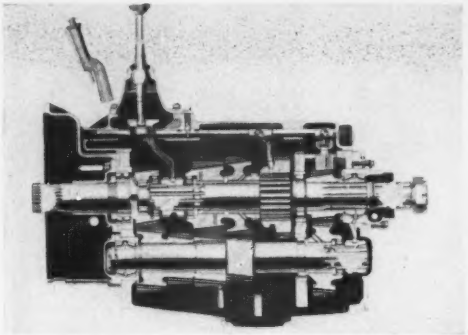
Increase Tool Life

Armor-Tuf, a steel-hardening compound, is guaranteed to increase the life of tools at least 30% or your money back, according to Armor-Tuf Sales Corp., New York, N. Y.

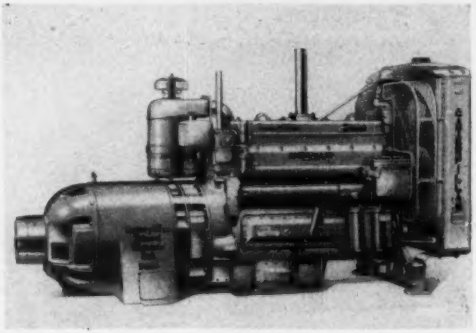
Easy steps in application are:

1. Heat tool to cherry red in furnace, forge or by torch.
2. Dip or roll in Armor-Tuf, covering completely.
3. When crust forms, reheat in furnace or by torch.
4. Quench quickly in water, brine or oil.

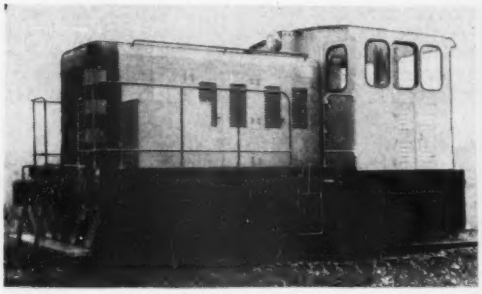
For further information, circle No. 10 on the postage-free reply card. (10)



TRANSMISSION for use with torque converters is designed for trucks up to 400 hp. Designed with closely spaced gear ratios and high ratio of capacity to weight. Fuller Mfg. Co., Kalamazoo, Mich. (11)

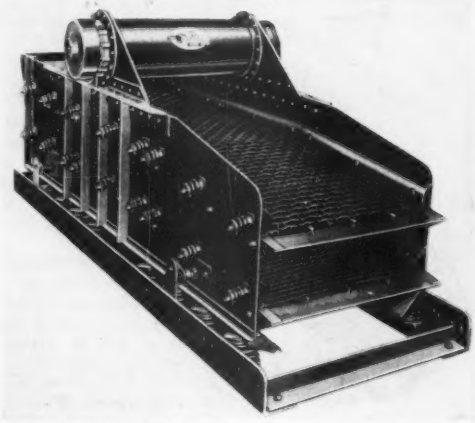


ELECTRIC SET features new high-speed diesel engine. The 12-hour rated output is 80 kw. Set is available now as a 50-cycle unit, with a 60-cycle unit anticipated. Caterpillar Tractor Co., Peoria, Ill. (12)

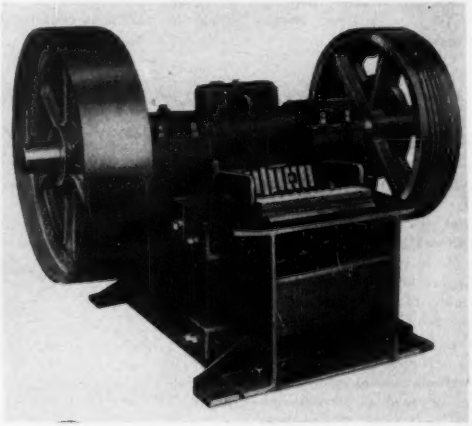


INDUSTRIAL LOCOMOTIVE built by Baldwin-Lima-Hamilton Corp., Eddystone, Pa., is a 35-ton, 190-hp. unit. Built for track gages from 30 to 66 in., starting tractive effort is 17,500 lb. at 25% adhesion. (13)

WAGON DRILL can drill in a 180-deg. arc at any angle. Can drill horizontally 10 ft. above or 3 ft. below ground level. Unit is self-propelled and self-powered. Schramm Inc., West Chester, Pa. (14)

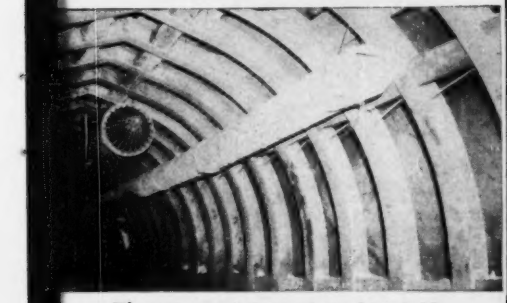


SCALPING SCREEN designed for rugged service has increased sizing efficiency according to Deister Machine Co., Fort Wayne, Ind. Headmotion features two-bearing construction and runs in oil bath. (15)

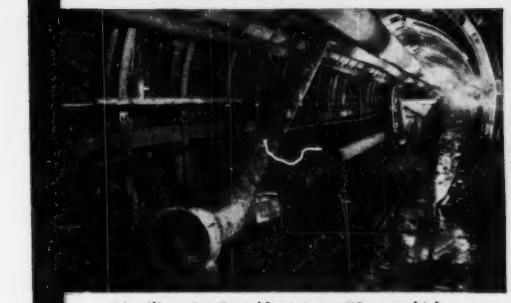


JAW CRUSHER, 10 x 16 in. has capacity of 4 to 40 tons depending on reduction required. Weighing 3,350 lb., it features a single wall pressed steel base that is strong but light. Pioneer Engineering Works. (16)

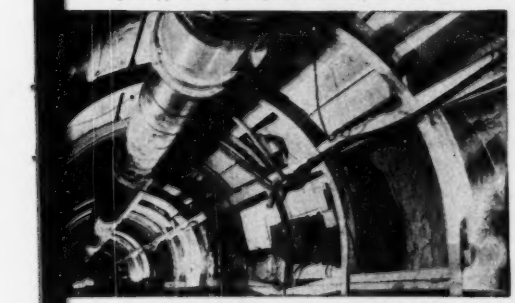
Looking toward the face of a Joy-ventilated tunnel one minute after round has been shot.



The same area just ten minutes later (with camera facing opposite direction). Effectiveness of the ventilating system is obvious.



Auxiliary Joy Portable Axivane Blower which furnishes cooling air and dissipates smoke quickly from the face after a round has been shot.



A Joy Series 1000 Axivane Fan mounted in the duct line of the main ventilating system. Note simplicity of installation and economy of space.

FOR TUNNEL-DRIVING OPERATIONS:

JOY AXIVANE FANS

Joy Axivane Fans provide a system of tunnel or mine ventilation that is unmatched for simplicity, ease of installation, economy of space, efficiency of operation and low overall costs.

Series 1000 Fans are *installed right in the duct,* without complicated bends and elbows. They actually become an integral part of the duct line! Additional fans are inserted as needed as the line is extended. (If power is not available throughout the tunnel or mine, Joy Axivane Fans may be gang-mounted in series at the portal with practically no loss of efficiency.) A Joy Axivane Portable Blower can be placed in a short, auxiliary duct that is laid up to the face. After a round has been shot, the fouled air is quickly blown away from the face by the Blower and sucked into the main ventilating system by the Axivane Fans.

Ordinarily, the fans exhaust the stale air through the duct line so that the main body of the tunnel is always filled with fresh air. If rock temperatures are excessive and the drift of air down the tunnel becomes too hot for comfort, the fans can be turned around so that they blow fresh, cool air from the surface, through the duct line, directly to the face.

It's a simple and easy installation—one designed to make maximum use of the inherent advantages of the Joy Axivane Fan. ● Let us show what a simple matter it will be to solve YOUR ventilating problems with Joy Axivane Fans.

Over 100 Years of Engineering Leadership

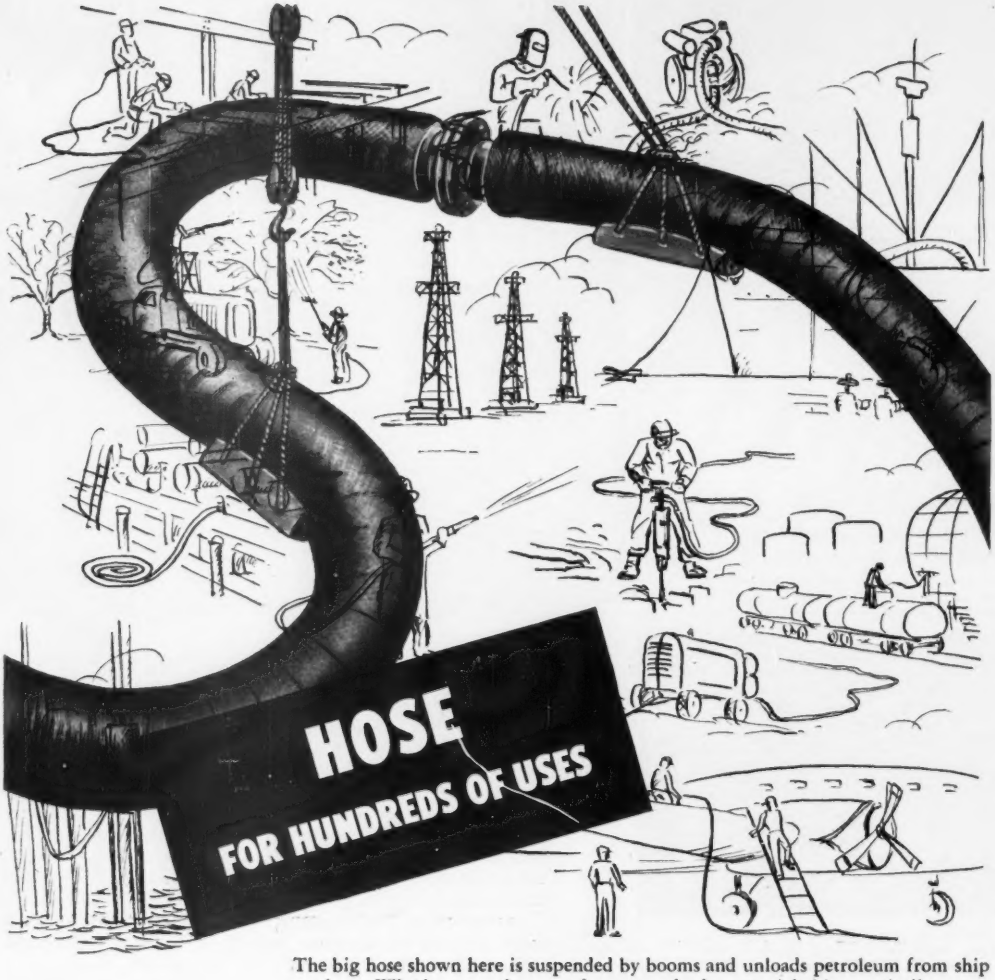
Consult a Joy Engineer

WBD M 4027

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



The big hose shown here is suspended by booms and unloads petroleum from ship to shore. Whether your hose needs are standard or special, it's practically a certainty Raybestos-Manhattan engineers have already designed the right hose for you. R/M hose constructions range from as small as ¼" paint spray hose to huge dredging hose big enough for a man to crawl through. The point is, you can't go anywhere to find better facilities or more experienced engineering to help you with a hose problem, than at Raybestos-Manhattan . . . and not only hose — it's true also of transmission, conveyor and V-belts . . . and all other products we make. Consult your R/M representative.

R/M

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For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

ELECTRIC POWER DISTRIBUTION. The complete electrical system for open-pit mines and quarries, from initial power distribution to maintenance of apparatus, is discussed in a comprehensive 39-page book, "Electrical Power Distribution and Protection for Open Pit Mines and Quarries." Every mining engineer should get a copy of booklet B-5447, issued by Westinghouse Electric Corp., Pittsburgh, Pa. (41)

TURBIDITY RECORDER. Here's an instrument that measures the amount of light cut off by undissolved substances suspended in fluids. A two-page flier, Bulletin No. 604, from Ess Instrument Co., Bergenfield, N. J., gives you its operating principles and range of application. (42)

PUMPS. Capacities, horsepower ratings, and uses of 17 general purpose centrifugal pumps of the cradle-mounted type, are covered in a 16-page bulletin (Form 7223) just released by Ingersoll-Rand Co., New York, N. Y. (43)

ARMCO PRODUCTS. "Armco Products for More Profitable Mining" is the title of a condensed six-page catalog describing and illustrating such products as Flex-Beam guard rail, corrugated metal pipe, liner plates, retainer walls, Steelox buildings, and miscellaneous types of pipe. Armco Drainage and Metal Products, Inc., Middletown, Ohio. (44)

COMPRESSORS. Worthington Corp. (Harrison, N. J.) tells an impressive story about their YC type, angle compressors. Lower power costs, less floor space, short installation time are just a few of the advantages listed. In addition, there are excellent illustrations to show how the units operate. (45)

WIRE ROPE. "If Rope Could Talk" is an attractive booklet issued by British Ropes Ltd. (Doncaster), that gives the reader a heart to heart talk from a wire rope on what's best for its maintenance and longevity. (46)

SAFETY EQUIPMENT. This 155-page tome runs the gamut of safety equipment from "Anti-Fogging Compound" to "Wurkahus, Rubber." If you are concerned at all with safety equipment for your company's employees, you should circle No. 47 on the reply card to get your copy of Bulletin 100 from Boyer-Campbell Co., Detroit, Mich. (47)

INDUSTRIAL TIRES. This 12-page guidebook released by B. F. Goodrich Co., shows their complete industrial tire line, which tire should be used in what service and a bushel of maintenance tips on tire care. (48)

COMPRESSORS. Rugged, moderate speed compressors, using bottled propane for fuel are described and discussed in attractive bulletin 124, released by Clark Bros. Co., Inc., Olean, New York. Specifications and engineering data on 80 to 330-hp. models, are presented. (49)

AUGER DRILLS. McCarthy vertical and horizontal drills in operation plus variety of augers and bits from different jobs, are the features of a four-page catalog issued by Salem Tool Co., Salem, Ohio. (50)

SAFETY. "The Story of Safety" is must reading for all mine and plant safety men as well as management. Not only is there a lot of "how to" in this story of Du Pont's safety program, but there is a new approach to the safety problem with analysis and interpretation. Published by E. I. Du Pont De Nemours & Co., Wilmington, Del. (51)

LIFT TRUCK. "How to Operate a Lift Truck" is Hyster Co.'s (Portland, Ore.) contribution to safe and efficient lift truck operation. Lots of good hints are graphically illustrated. (52)

WIRE ROPE. Here are 72 pages of practical information on proper methods of handling, reeving, breaking in, splicing, cutting, lubricating and specifying wire rope. 80 illustrations, 32 diagrams and charts. Circle No. 53 to get your copy of "Use and Care of Wire Rope," from A. Leschen & Sons Rope Co., St. Louis, Mo. (53)

LINATEX. What Linatex, a natural rubber, abrasion, corrosion, and chemical resistant, can do for you, is discussed and illustrated in a four-page folder. (54)

PNEUMATIC CONTROLLER. Catalog C-50 describes the P-4 Pneumatrol pneumatic controller for rate flow, differential pressure, liquid level, viscosity, pressure, and temperature applications. (55)

PUMPS. Frame-type centrifugal pumps designed to handle most ordinary pumping jobs requiring capacities up to 500 gpm and heads as high as 135-ft., are described in Bulletin 52B6691A, released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. (56)

VIBRATING SCREENS. A description of the complete line of vibrating screens for the mining industry is contained in the eight-page Bulletin 07B7868, released by Allis Chalmers Mfg. Co., Milwaukee, Wis. (57)

AUDIOPHONE SYSTEMS. What this simplified method of electronically amplified voice communication can do

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after February 1, 1953, if mailed in the U. S. or Canada.

Engineering and Mining Journal—December, 1952
NOT GOOD AFTER JANUARY, 1953—If mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	44	51	58	65	72	79
2	9	16	23	45	52	59	66	73	80
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7	14	21	43	50	57	64	71	78	85

My Name ..... Position .....

Company .....

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for your mine or plant is the subject of a brief four-page bulletin available from Farmer Engineering and Mfg. Co., Irwin, Pa. (58)

HYDRAULIC HOISTS. A series of 15 technical data bulletins describing the complete line of hydraulic hoists made by Galion Allsteel Body C.., Galion, Ohio, is now available. Each bulletin includes full specifications for one individual hoist. Interesting feature is a handy hoist capacity reference table. (59)

PROTECTIVE COATINGS. Ricwilite 1060 and Ricwilite 7100, baked-on and cold-setting phenolic resin coatings are discussed in two folders issued by Ric-Wil Plastic Coating & Mfg. Corp., Salem, Ind. Both offer permanent protection against corrosive conditions. (60)

LUBRICATION. A comprehensive presentation of whys and wherefores of lubrication is provided in an attractive, well illustrated 26-page booklet published by Euclid Road Machinery Co., Cleveland, Ohio. (61)

ROOF BOLTING. The September issue of Ohio Brass Co.'s "Haulage Ways" amounted to a roof-bolting manual. The company has extra copies available, and you can get one by circling No. 62 on the reply card below. Subjects covered are current techniques, accessories, testing installed bolts, use of hole gage, and equipment in use. (62)

"KNOW YOUR CARBURETOR." This illustrated booklet is pointed particularly to the man who has not had extensive training in carburetor servicing. It describes in nontechnical language the basic theory of the carburetor, its various parts, and the common carburetor troubles usually encountered and how to correct them. Pennsylvania Refining Co., Cleveland, Ohio. (63)

TACHOMETERS. A new bulletin describing its full line of recording and indicating tachometers has just been published by Bristol Co., Waterbury, Conn. (64)

PACKING. A 20-page catalog, PC-102, covering all Palmetto packings is available from Greene, Tweed & Co., North Wales, Pa. Photographs, diagrams, and cutaway views highlight the text. (65)

TEMPERATURE MEASUREMENTS. If you want to know just how a temperature recorder is made and works, from bulb to chart, Foxboro Co., Foxboro, Mass., has a 20-page bulletin (447) which should interest you. (66)

CRUSHING, SCREENING. "Basic Units for Stationary Crushing, Screening and Washing Plants" explains the purpose, features and specifications of crushers, feeders, conveyors, screens, scrubbers, dehydrators, bins and related units made by Pioneer Engineering Works, Inc., Minneapolis, Minn. (67)

REBUILDING DIESELS. Here is a company that specializes in rebuilding cylinder heads and blocks for diesel engines. Ralph Stark, Inc., Long Island City, N. Y., tells you all about this service in a six-page folder. (68)

SELENIUM RECTIFIERS. American Rectifier Corp., New York, N. Y., answers 11 questions on selenium rectifiers in Bulletin 271. The company claims high efficiencies. Ratings up to 12,000 v. ac, 10,000 v. dc. (69)

AIR CYLINDERS. Diagrams, charts, and photographs help explain capacity, type of mounting, etc., for the complete line of air cylinders manufactured by Lindberg Engineering Co., Chicago, Ill. (Bulletin #731) (70)

CIRCUIT BREAKERS. "What You Should Know About Circuit Breakers" is 16 pages of just that. Colored charts and diagrams make explanations simple, easy to follow. Manual 101 is published by Heinemann Electric Co., Trenton 2, N. J. (71)

VIBRATING SCREENS. The Gyroset screen has a positive eccentric action giving a full circle throw throughout the screen surface. It is the two-bearing type with a minimum of moving parts. Bulletin 852 from Productive Engineering Co., Chicago, Ill., gives you pertinent facts and figures. (72)

OXYGEN AND NITROGEN. If you think you can save money by making your own oxygen and nitrogen from air, Air Products Inc., Allentown, Pa., has both large tonnage and high purity units for you. Their Catalog No. 52 tells all about these units. (73)

FANS. Some 11 sizes of new industrial fans and their standard wheels are fully described in a new 12-page booklet available from Westinghouse Electric Corp. (74)

PURCHASING PROCEDURES. Are you bogged down by needless detail and missing facts? "Purchasing Procedures that Save Time and Money" may well show you how to solve your problems, simplify your present routine. The 20-page book is issued by Remington Rand, New York. (75)

PUMP SELECTION. "Handy Guide to Selection of Centrifugal Pumps" contains much useful information, but is concerned mainly with the line of centrifugal pumps made by Allis-Chalmers, Milwaukee, Wis. (76)

WIRE ROPE. Four catalogs offered by American Chain & Cable Co., Inc., should be in your wire rope file. DH-128 and DH-129 contain wire rope recommendations for mining industries. DH-220 is four pages of information on the company's boom cable assemblies. DH-311 describes the Dualoc wire rope ending. (77)

TOURNAROCKER. What makes the Tournarocker tick and why R. G. LeTourneau Inc., Peoria, Ill., thinks its product is the best on the market, get considerable coverage in bulletin TK-137, with information on the 9, 18, 35, and 50-ton units. (78)

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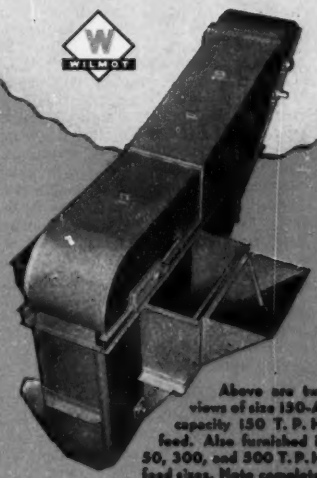

Above are two views of size 150-A; capacity 150 T. P. H. feed. Also furnished in 50, 300, and 500 T. P. H. feed sizes. Note complete-in-1-unit construction.

In addition to eliminating such common heavy-media problems as fluctuation of bath density and loss of product to refuse, the new Wilmot-Daniels Heavy Density System also introduces radical advances in simplicity. For instance: this system requires no densifier; no thickener, no thickener tank, no thickener pump; and magnetizing blocks are eliminated. In addition to these 5 major parts, 4 less motors are required. Refuse is moved by a simple drag-line conveyor. As a result of this compactness, the Wilmot-Daniels Heavy Density System requires about 20% less floor space than other heavy-media systems. To further lower the cost of installing this system, it is custom-designed to fit your floor space. This can effect substantial savings over "package units". Let us send you complete technical details of how this new system operates and cuts costs for metal and coal producers.

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WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

- **Better Washington Climate Anticipated**
- **Civil Service Can Limit Housecleaning**
- **New Metals Controls Anticipated**

MINING, LIKE ALL INDUSTRIES, will find the new climate in Washington more comfortable than it has been for two decades. You can expect less sniping at the depreciation allowance rate for mining, stronger prospect that exploration costs will be made deductible for tax purposes, and a more realistic public lands policy.

There will also be a less zealous drive to bolster foreign economies at the expense of domestic mining and more sympathetic approach to the problems of business in general.

Less housecleaning than you might look for in government agencies dealing with mining may be expected. The bureaus are heavily staffed with technical personnel protected by Civil Service tenure.

Top officials will be out: Oscar Chapman, Secretary of the Interior, and Jess Larson, administrator of GSA and DMPA. Chapman, a former Denver attorney, will open a law office in Washington. Larson, a one-time Oklahoma City attorney, plans to go into business in the Southwest.

Before election, both Henry H. Fowler, director of ODM and administrator of DPA, and Richard A. McDonald, administrator of NPA, had announced their intentions to resign by the end of the year. Fowler is on leave from his Washington law firm; McDonald is on leave as executive committee chairman of the Crown-Zellerbach Corp., San Francisco.

Howard I. Young, DMP's deputy administrator, who came to Washington for six months and has stayed 15, will probably remain on the job. Chances are that Clarence O. Mittendorf, administrator of the DMEA will stay on, too.

In the old-line Interior Department agencies, John J. V. Forbes, director of the Bureau of Mines, William E. Wrather, director of the Geological Survey, and Marion Clawson, director of the Bureau of Land Management, have all submitted resignations. The first two jobs are filled by Presidential appointment. Forbes and Wrather, both long-time government men, have considerable mining industry support, and might be kept on the job by Eisenhower. The BLM post—less technical, more political—is filled by the Secretary of the Interior, so Clawson will be replaced.

Among the key Congressional committees for mining, Sen. Hugh Butler (Neb.) will become chairman of the Senate Interior and Insular Affairs Committee; Rep. Dean P. Taylor, (N. Y.), chairman of the House Committee. Rep. Wesley A. d'Ewart (Mont.) will replace Rep. Ken Regan (Tex.) as chairman of the House Subcommittee on Mines and Mining.

Sen. Homer E. Capehart (Ind.) and Rep. Jesse P. Wolcott (Mich.) will head the two Banking and Currency Committees, which handle defense controls legislation. The Armed Services Committees, in whose jurisdiction stockpile programs fall, will be chaired by Sen. Leverett Saltonstall (Mass.) and Rep. Dewey Short (Mo.).

The Senate Armed Services Committee's Preparedness Subcommittee, over which Sen. Lyndon B. Johnson (Tex.) has presided and which has been extremely active in the metals field, will have to be reorganized in January. If it is set up again, Sen. Styles Bridges (N.H.) would be the ranking member; but he's got bigger plans in mind and it is doubtful that he would accept the chairmanship.

New Metals Controls

It's a good bet that there will be some sort of materials control after June 30, when the allocations and priority provision of the Defense Production Act runs out. Mobilization officials are already drafting a new controls scheme, and they think the Republicans will buy it. Here's how it would work:

DPA or a successor civilian agency would allot steel, copper, and aluminum to the Defense Department for use by military contractors. Mills would be required to give these orders priority, then be able to sell metals unrestrictedly to civilian consumers.

The system can best be described as a "military controlled materials plan," and would be similar to the pre-CMP defense-order rating procedure. The allotments would be a strict limitation on the military take. The harness would be put on to prevent the pile-up of inventories—a distinct likelihood when the military is given its head. But civilian metals users won't even get tied down with paper work.

Allocations of the scarcer materials —cobalt, columbium, molybdenum, nickel, tantalum, tungsten, and diamond bort—would be continued, too.

The Pentagon is behind the retention of a production controls mechanism. It can be expected that Gen. Lucius Clay, former aide to Charles E. Wilson when he was ODM director, and now a top Eisenhower adviser, will be another proponent. Republican leaders in Congress who have been close to the mobilization program as members of the Joint Committee on Defense Production will probably go along, too.

"Military CMP" doesn't necessarily need an extension of the Defense Production Act. If Congressional opposition gets rough because of a general repugnance toward controls as such, mobilization lawyers think the Selective Service Act can provide the limited allocation authority—admittedly an awkward arrangement, however.

South Korea's Tungsten

The U. S. Army is about to relinquish control of South Korea's rich tungsten mines. The mines have been operated jointly by the Army and the Korean Mining Corp. (an agency of the Republic of Korea). R. O. K. now plans to name the Utah Construction Co., Lark, Utah, as manager of the mines.

Col. John J. Livingston, now at the Pentagon as strategic materials consultant on Korea for the Army's military government branch, headed up the tungsten operations in South Korea for 21 months as utilities and mining officer for the U. S. Eighth Army. He was a mining engineer in Missouri at one time.

Actual tonnage figures on South Korean tungsten output are highly secret, but it's reportedly highest ever attained in the country. It's way above the Bureau of Mines' conservative published estimate of 900 tons for 1951. Plans are now to double the output. GSA's stockpile purchase commitments are big enough to support the installation of additional equipment and the expansion of existing facilities.

The tungsten mines are in territory infested with Red guerrilla troops. A battalion of U. S. infantrymen is deployed in the area to defend the mining operations.

Natural Resources Conference

The controversial report of the President's Materials Policy Commission (William S. Paley, chairman) is in for a full-scale public review.

The commission's proposals and other aspects of natural resources policy will be thrashed out at a special conference in Washington, Mar. 25-27, to be sponsored by Resources for the Future, Inc., a new, private research corporation, which was originally set up as an advisory body to the Ford Foundation on natural resources con-

servation. Horace M. Albright, president of the U. S. Potash Co., Inc., and former director of the National Park Service (1929-33), heads the organization.

The White House will cooperate on the conference, President-elect Eisenhower has announced. About 1,000 industrial, farm and labor leaders and top government and academic figures in the field of conservation will attend. Among those to be invited is Andrew Fletcher, president of the St. Joseph Lead Co., and one of the Paley Report's most articulate critics.

Albright is a stout defender of the report. Included on the board of directors of his new organization are Paley; Edward J. Condon, vice president of Sears, Roebuck & Co. and former president of Friends of the Land; Dr. Reuben G. Gustavson, University of Nebraska chancellor and a former official in the Argonne National Laboratory for Atomic Energy; Leslie A. Miller, former Wyoming governor and chairman of the Hoover Commission's resources task force; Fairfield Osborn, noted author and president of the Conservation Foundation; and Charles W. Eliot, former director of the National Resources Planning Board and now a Ford Foundation official.

In addition to the Paley Report, these will also serve as subject matter for discussion at the conference: the report of the President's Water Resources Policy Commission (issued almost two years ago); a study by the National Security Resources Board on how to put Paley Commission proposals into effect (to be issued this month); the Hoover Commission's report on organization of governmental natural resources agencies; atomic energy programs; the "social values" of conservation.

This will be the first big-time conference of its type since 1908, when the White House National Conservation Conference was held. From that stemmed the first important plans for reclamation, national reforestation, and waterways management.

Albright's organization is looking for developments just as significant at its March meeting, at which industrial materials will be the big topic. It should be a lively affair. If you're interested in attending, write for details to Charles W. Eliot, executive director, Resources for the Future, Inc., Rm. 706, 1625 Eye Street, N. W., Washington, D. C.

Brief, but Important:

Chances of labor unity are brighter. There is more talk of organized labor getting together again because of recent developments. Within two weeks, both Philip Murray, president of the CIO, and William Green, head of the AFL, died. Mine-Mill leaders are said to be hoping to get back into CIO, now that Murray is gone.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

INVESTIGATING COMMUNISTS UNDER REPUBLICANS: The Republican victory in the elections means the death of the McCarran Internal Security Subcommittee which investigated the Mine, Mill and Smelter Workers. But the House Un-American Activities Committee will probably take up where Sen. McCarran left off.

What will happen in the Republican Congress is this: Sen. William Langer of North Dakota is likely to become chairman of the Senate Judiciary Committee. Sen. McCarran has run this committee under the Democrats. He put through the present internal security law and has headed a special Internal Security Subcommittee which has been investigating Communist influences in labor unions.

Sen. Langer not only is opposed to the Internal Security Act; he argued against it all night on the Senate floor before he collapsed and had to be carried out. Moreover, he is pro-labor, having voted against the Taft-Hartley Law. He is one of the few Republicans supported by organized labor in the elections. He will probably discontinue the Internal Security Subcommittee.

Nevertheless, Sen. McCarran will issue a report on the "Red" condition in Mine-Mill, push Congress to adopt his bill to make it unlawful for a Communist to hold office in a union or represent it in bargaining. Moreover, it would permit employers to discharge members of subversive groups or employees who refuse to tell a Congressional committee whether they are Communists.

You will hear more from the House Un-American Activities Committee under its new chairman, probably Rep. Harold H. Velde of Illinois. Velde is a former F.B.I. agent who worked on sabotage and counter-espionage, entered World War II as a private.

JUSTICE DEPT. MAY ACT: Under a Republican attorney general, there is a better chance that criminal action may be taken against left-wing union leaders who falsely signed non-Communist affidavits. The Dept. of Justice will quit dragging its feet on this issue. After long claiming that this part of Taft-Hartley was unenforceable, government attorneys finally prosecuted some small-fry local officers of the CIO United Packinghouse Workers. They got a conviction and jail sentence in Camden, N. J., and an indictment in Detroit.

TAFT-HARTLEY REVISION: Don't look for any drastic changes in Taft-Hartley from the Republican Congress. There are no plans to curb industry-wide bargaining, break up "labor monopolies" or alter the national emergency section of the law, although there will be considerable pressure to do so. Some important changes you can expect:

- Employers will have to sign non-Communist affidavits, too, if they want to use the National Labor Relations Board.
- NLRB will be enlarged from five to seven members, giving Eisenhower two new appointments and the chance to designate his own chairman. Judicial and prosecution functions will be more clearly separated, with an administrator replacing the general counsel.
- Economic strikers who have been replaced in their jobs will not be denied the right to vote in a bargaining election.

COPPER WAGE INCREASE APPROVED: The eight-cent hourly wage increase granted by major copper producers last August finally got clearance from the Wage Stabilization Board on Nov. 21. It's retroactive to July. Wage controls will run out April 30. But don't jump the gun before then with any wage or salary increases that may exceed the control limits. The government will prosecute violations right up to the last day.

PERSONAL NEWS

RICHARD S. NEWLIN (left), heretofore assistant vice president in charge of mining operations for Anaconda Copper Mining Co., New York, N. Y., has been elected vice president in charge of mining operations. He succeeds CLYDE E. WEED, recently elected vice president in charge of operations of the company and its subsidiaries. THOMAS A. CAMPBELL (center), vice president and managing director of the Chilean subsidiaries, has been elected executive vice president of the Chilean subsidiaries, succeeding BURR WHEELER (right), retiring after 38 years.

J. P. Caulfield has been appointed assistant general manager, Western Mining Divisions, Kennecott Copper Corp. **L. F. Pett**, general superintendent of operations, has succeeded Mr. Caulfield as general manager of the Utah Copper Division.

Jean Guy Montpetit has accepted a position as supervisor with Quebec Iron & Titanium Corp., Sorel, Can.

M. J. Cahalan, formerly with the Ministry of Supply, Atomic Energy Research Establishment, Harwell, Eng., has been appointed assistant mill superintendent, Rio Tinto Co., Huelva, Spain.

James S. Vanick, research metallurgist, The International Nickel Co., Inc., New York, N. Y., was awarded a citation in the annual awards by the Gray Iron Founder's Society "for his outstanding contributions to metallurgical knowledge, improved production, and wider use of gray iron products. . . ."

Joseph A. Martino, president of National Lead Co., New York, N. Y., has been elected a member of the board of directors, Chase National Bank.

Weston Bourret has resigned as deputy director of the Domestic Expansion Division, Defense Materials Procurement Agency, to join Utah Construction Co., San Francisco, Calif., as mining geologist. **Justin B. Gowen**, chief of the division's Copper Branch, will succeed him.

Samuel K. Scovil has been appointed assistant manager of ore sales, Cleveland-Cliffs Iron Co., Cleveland, Ohio. **Robert P. Probeck**, accountant, is now manager of the tax department.

George M. Humphrey, chairman of the board of M. A. Hanna Co., Cleveland, Ohio, has been named Secretary of the Treasury by President-elect Eisenhower. Mr. Humphrey, also chairman of Pittsburgh Consolidation Coal Co., Hanna subsidiary, has announced he will sever all business connections to devote himself to this work.

Dr. Raymond H. Hartigan has been appointed assistant director of research on the executive staff of Mellon Institute, Pittsburgh, Pa., in which capacity he will participate in the management of activities.

Frederick B. Hufnagle, Greenwich, Conn., has been elected a director of The Beryllium Corp. and its subsidiary, Beryllium Development, Inc. Mr. Hufnagle was formerly president and chairman of the board of Crucible Steel Company of America.

Lewis Lloyd, president of Alatex Construction Service, Inc., New Orleans, La., was elected president of the Perlite Institute for two years, succeeding **J. John Brouk** of the Precast Slab and Tile Co., St. Louis, Mo. **J. C. Kingsbury**, president of **F. E. Schundler & Co., Inc.**, of Joliet, Ill., was elected vice president. **Neal D. Snyder**, Combined Metals Reduction Co., Salt Lake City, Utah; **K. J. Bercaw**, Great Lakes Carbon Corp., New York, N. Y.; and **Kirk E. Hazelton**, Cleveland Gypsum Co., Cleveland, Ohio, were elected to the board of directors.

David E. Coombes has been appointed assistant to the plant engineer, Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont. **George Blacklock** succeeds Mr. Coombes as chief electrical engineer. **L. J. May** is now plate shop foreman, replacing **James Cowan**, who passed away after 32 years with the company.

Clyde W. Hall has retired as president of United Clay Mines, Corp., Trenton, N. J., and has become chairman of the board.

Ralph E. Wilson, director of metallurgy in the steel and tube division of the Timken Roller Bearing Company of Canton, Ohio, has been elected president of the American Society for Metals.

C. M. Beck has transferred from the Helen mine to Sault Ste. Marie as assistant to the general manager of Algoma Ore Properties, Ltd., **George W. MacLeod. M. A. Twidale** will be manager of the Helen mine at Jamestown, **Harold Scott** will be assistant manager, and **R. F. Palmer** will be mine superintendent.

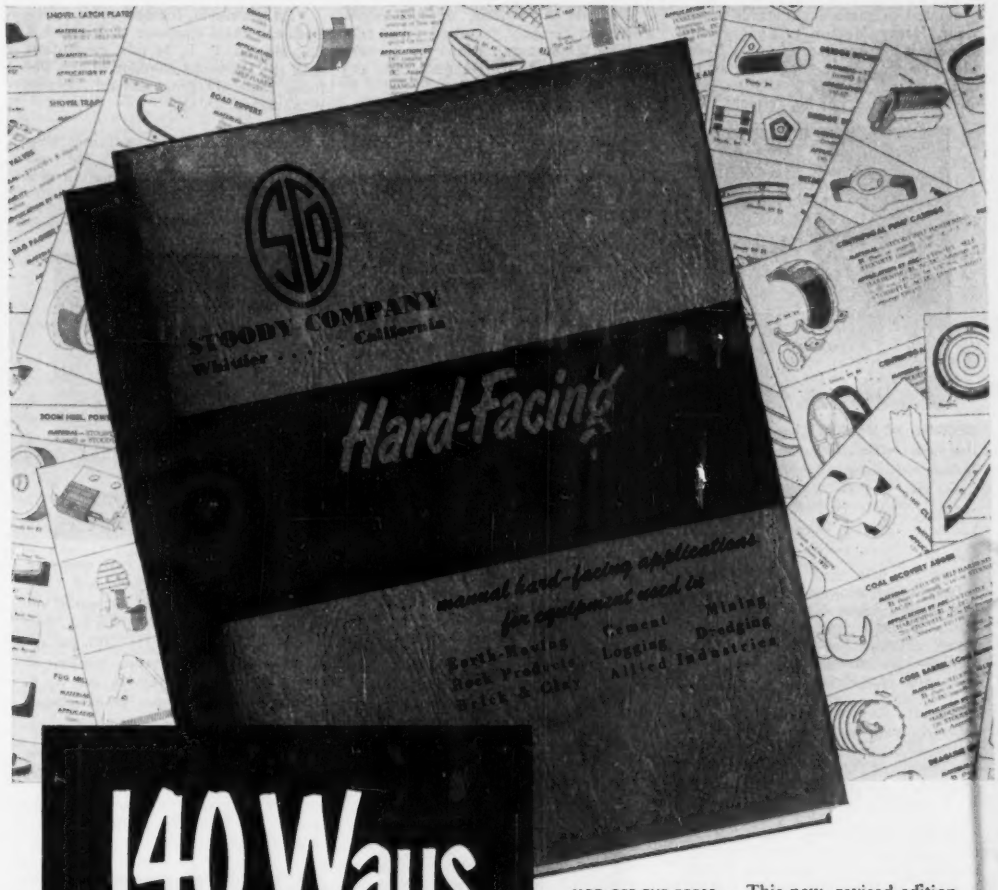
Lin Barry is now general manager at the King lease on the Camp Bird mine near Ouray, Colo. He succeeds **Harold Worcester** who resigned after two years' service.

Arnold H. Miller, consulting engineer of New York, N. Y., has been retained by the Phoenix Primera Lead-Zinc Mines at Lajal, Manzanillo, Oriente, Cuba, and is now in Cuba doing examination and planning work for their operations.

RUSSELL G. HAWORTH, resident manager of Potash Company of America, New York, N. Y., has been appointed vice president in charge of production in addition to his present position.

Edward Peterson, formerly with Virginia - Carolina Chemical Co., Nichols, Fla., has joined Pickands, Mather & Co.'s engineering department at Hibbing, Minn.

William Burgess has become assistant superintendent of the production engineering department, Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont., succeeding **H. Bressler**, resigned. **Robert Gavan** has been



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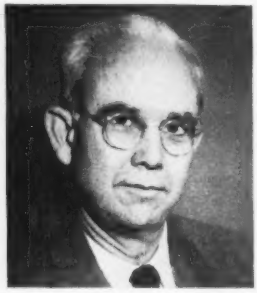
TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

promoted to surface standards supervisor, **Henry Matson** to underground standards supervisor, and **Henry Lloyd** as timestudy supervisor in the underground standards section, production engineering department.



GEORGE W. MOYERS has been elected vice president in charge of the Phosphate Division, International Minerals & Chemical Corp., New York, N. Y., following the resignation of FRANKLIN FARLEY. Mr. Moyers has been handling domestic and foreign phosphate sales.

Len Bound, mine captain at Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont., has retired after 30 years' service. Mr. Bound has been employed as transportation boss, shift boss, and mine foreman.

Gus H. Goudarzi, native of Iran, formerly employed as a geologist in Butte, Mont., is in Saudi Arabia on a minerals exploration program as a geological survey technician of the U. S. Department of the Interior.

Chester H. Steele, Butte, Mont., vice president in charge of western operations of the Anaconda Copper Mining Co., has been elected a director of the Metals Bank & Trust Co., Butte, Mont.

Thomas K. Graham, Great Falls, Mont., superintendent of the zinc plant of the Great Falls reduction department, Anaconda Copper Mining Co., has been promoted to assistant general superintendent of the entire reduction works.

William R. Ryan, Duluth, Minn., supervisor of personnel for the Oliver Iron Mining Division since 1938, has retired. Mr. Ryan joined the company as chief clerk.

John Steinke, superintendent of timberlands since 1946 for the Oliver Iron Mining Division, has retired. He began work with the company as a timber cruiser and has been camp foreman, chief estimator, and assistant superintendent.

A. L. Payne, formerly with American Smelting & Refining Co.'s Western Mining Department, is now at Minas de Matahambre, Prov. de Pinar del Rio, Cuba.

Glenville A. Collins, mining engineer, has recently returned from extensive mine examinations on Rocher Deboule mountain, Hazelton, B. C.

Oscar M. Wicken has joined Foote Mineral Co., Philadelphia, Pa., as manager of the Sunbright, Virginia Division. Mr. Wicken was formerly manager of the magnesia recovery plant at Cape May, N. J. for Northwest Magnesite Co.

Henry Maki of Virginia, Minn., a mining captain for E. A. Young, Inc., has retired at 70 after 50 years in underground mines of the Mesabi and Cuyuna Ranges. Company officials honored him with a dinner, presenting him with a wrist watch.

Arthur C. Bigley, manager of mines of Anaconda Copper Mining Co., has been appointed general manager of Western mining operations. **Edward I. Renouard**, general superintendent of mines, becomes manager of mines, and **A. R. Sims**, assistant general superintendent of mines, is now general superintendent. **Edward Bonner, Jr.**, formerly mine superintendent, is now assistant general superintendent of mines. **Joseph Canavan** has been promoted from assistant mine foreman to mine foreman.

FRANK R. MILLIKEN, formerly with National Lead Co., has been appointed a vice president of Kennecott Copper Corp., New York, N. Y., and will assume supervision of the company's mining operations in this country and in Chile.

Andrew Fletcher, president of St. Joseph Lead Co., N. Y., has been elected president of the American Institute of Mining and Metallurgical Engineers to take office in February. Mr. Fletcher has been treasurer since 1944 and a director many years.

John N. Butler, formerly consultant with Nevada Scheelite Co., Fallon, Nev., is now with Mackay School of Mines, Reno, Nev., as project engineer in charge of the A.E.C. research program on uranium ore beneficiation.

Jamaica Bauxites, Ltd., Mandeville, Jamaica, B.W.I., has changed its name to **Alumina Jamaica, Ltd.**

V. A. Brussolo, formerly vice president and chief engineer of Soriano & Co., Manila, P. I., is now consultant with the Domestic Division of the Defense Minerals Procurement Agency, Washington, D. C.

Marshall Haney, consulting mining engineer of Takoma Park, Md., recently completed the examination of a large manganese deposit in Rockbridge County, Va.

R. L. LLOYD (above) has been appointed general manager of advertising and R. A. WHEELER, assistant general manager of advertising, The International Nickel Co., Inc., New York, N. Y. M. J. PHILLIPS was appointed assistant to the general manager of advertising and H. S. LEWIS and A. P. MORE, assistant managers of advertising.

Charles A. Mitke has been in Africa for the past six months visiting Uganda, Kenya, South Africa, Belgian Congo, and Southwest Africa, in the interests of New York and Toronto capitalists.

W. Page Morris, manager of Duval Sulphur & Potash Co., Carlsbad, N. M., has been elected president of the New Mexico Mining Association, succeeding **John A. Wood**, mining engineer with Chapman & Wood.

MICHAEL D. DAVID has been appointed secretary of Cerro de Pasco Corp., New York, N. Y. Formerly assistant secretary, Mr. David succeeds Robert F. Mitchell, who will continue as treasurer.

OBITUARIES

Lewis E. Hanley, chairman of the board of the Hecla Mining Co., died in his sleep on Nov. 16 in Wallace, Idaho. With the company since 1902, Mr. Hanley retired as president in May, 1951, because of ill health. A graduate of the University of Idaho, Mr. Hanley had also been president of the Sullivan and Polaris Mining Companies, vice president of Resurrection Mining Co., and director of the Coeur d'Alene Hardware and Foundry Co.

John Church, 67, passed away on Nov. 10 in Washington, D. C. Mr. Church was a special assistant to the director, foreign expansion division of the Defense Materials Procurement Agency. He also served with the Economic Cooperation Administration and the War Production Board.

Fay Harrison Miller, 63, passed away at his Menlo Park, Calif., home on Sept. 18. A graduate of the Washington State College, Mr. Miller had a wide acquaintance in the mining industry. He joined the staff of The Dow Chemical Co., in 1934, and remained with them until retirement in 1950.

Willett H. Barton, metallurgical chemist, identified with the mining industry of Nevada since 1906, died on Oct. 25 at the age of 76. Well known for his successful extraction methods, he was an authority on Nevada minerals.

Wm. J. Loring, 83, passed away in Tonopah, Nev. In mining since he was 14, Mr. Loring acquired H. C. Hoover's interest in Bewick, Moreing & Co., and reopened Plymouth Consolidated properties, Plymouth, Calif.

Edward A. Schuch, 49, chief engineer for 38 years at Aero Service Corp., Philadelphia, Pa., died at his home in Feasterville, Pa., on Nov. 11.

McHenry Mosier of Chevy Chase, Md., executive officer of the Region VIII Bureau of Mines-Geological Survey Field Team passing upon mineral exploration projects for the Defense Minerals Exploration Administration, died Oct. 19.

Dr. Hans Merensky, 81, passed away in the Northern Transvaal, S. A., on Oct. 21. He discovered the diamond deposits at the mouth of the Orange River, the "Oyster Beds" at Alexander Bay, and the Namaqualand deposits. The platinum-bearing reefs in the Bushveld Complex were his discovery and bear his name.

Charles McCrea, 74, former Ontario cabinet minister and president of Toronto General Trusts Co., passed away on Oct. 30. A king's counsel and member of Ontario legislature, he was minister of mines from 1923-1934, and president of Negus Mines, Ltd.; chairman of the board, Mining Corporation of Canada; vice president and director, Normetal Mining Corp., Quemont Mining Corp., and Base Metals Mining.

Henry J. Cochran, chairman of the board of Franklin Savings Bank, New York, N. Y., died at 73. Mr. Cochran was for 40 years a member of American Smelting and Refining Co.'s board of directors and its finance committee for 30 years.

Roy Elwood Cohn passed away at 68. Mr. Cohn was manager of American Smelting and Refining Co.'s subsidiary, Cia American Smelting in Santiago, Chile, when he retired from active service in 1949.

Joel Watkins, 70, former consulting geologist and member of the Virginia State Conservation Commission died on Oct. 27 in Charlotte Courthouse.

Felix Shulist, employee of the mine department, Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont., passed away on Oct. 14 at 64.

APPRECIATIONS

Arthur Lucian Walker

Dr. Arthur Lucian Walker died at 89 on Sept. 30 at the Hillcrest Nursing Home, Whippany, N. J., where he had been for some time.

He was born in New York, son of Thomas George and Lucy Holbrook Walker, and was a great grandson of Philip E. Thomas, first president of the Baltimore & Ohio Railroad.

He graduated as mining engineer from the Columbia School of Mines at the age of 20, and went to Arizona. He was employed for three years by the Old Dominion Copper Co., at Globe, first as chemist and assayer, later as assistant superintendent. In 1886 he returned to New York City for some work as iron metallurgist, but shortly went back to Arizona as mining engineer for the Silver King Mining Co., Silver King, Ariz. In 1888, he returned to Globe as superintendent of the Old Dominion for five years. During his Arizona career, there were two major Indian campaigns in that territory. In 1893 he became manager of the Baltimore Electrolytic Refining Co., though he was also consulting engineer for the Old Dominion Copper Co. during 1893 and 1894. At the Baltimore Electrolytic Refining Co., he made some great improvements in the treatment of impure copper by electrolysis. It was during this period at the Refining Co. that the writer had the pleasure of first meeting Arthur Walker, and saw his original casting wheel on which he had shortly before filed his patent application.

At this time casting was done by hand, a most arduous, unpleasant task, but the writer later heard much gossip as to the bitterness with which the Welsh furnacemen fought the new wheel. Judging from this gossip, only a man absolutely sure of his metallurgy and mechanics, and also of a high executive talent, could have carried through the wheel to any early success. Actually the wheel created jobs. The original patent, which also described the use of a tilting ladle was issued Jan. 11, 1898, and another covering the hydraulic drive was issued April 11, 1899. Nearly 10 years later, he took out a third casting-wheel patent, embodying the improvements resulting from his long experience with it.

In 1898 he was made manager of the Baltimore Copper Works as well as of the refinery, but in 1899 he went to the Guggenheim plant near Perth Amboy as manager. This became the American Smelting and Refining Co.'s Maurer plant. While here he took out some patents on electrolytic refining, including one that cut out about 60% of the copper tied up in bus bars and electric connections, a step that can still be seen embodied in present day multiple-system installations. He also greatly improved the process of blue-vitriol manufacture.

In 1906 he was made director of and consulting engineer for the AS&R Co. In the next two years he was mainly on the Pacific Coast in charge of construction work, resigning from the AS&R connection in 1908 to become professor of metallurgy at Columbia University, a chair held until his retirement in 1929. He was also lecturer (1912) in the Post-Graduate School of the U.S. Naval Academy and at Harvard (1919). During World War I, he was ordnance consultant for the War Department. From 1908 to 1933 he practiced as metallurgical consultant and was a contributor to the technical press for several years after that. In 1939 he received the Egleston Medal for distinguished achievement in engineering. He was a member of the division of engineering of the National Research Council.

He joined the American Institute of Mining and Metallurgical Engineers in 1885 and the Mining and Metallurgical Society of America in 1908 within a month or two of its establishment. He was largely responsible in 1930 for turning a number of engineers who met irregularly as a social group, in the old Cable Restaurant on Beaver Street into the Mining Club. Mr. Walker was the first President of this organization (1930-1932). That this club survived these depression years and added to the number of its members and to its bank account, can be largely ascribed to his business judgment and to the liking in which he was held by his professional associates.

He leaves a widow, Mrs. May Richmond Walker, and a son, A. Lucian Walker.

So we have taken earthly leave of Arthur L. Walker, recognized for his engineering ability and his executive capacity, a brilliant teacher, a man of high ideals carried into his daily life, and a pleasant and entertaining friend.

DONALD M. LIDDELL,
Secretary
Mining and Metallurgical Society of America

MARKETS—Trends and Prices *(Continued from page 69)*

Summary of Copper Statistics

Following is a summary of the most recent copper statistics of Copper Institute, embracing most of the free world's supply of the metal, figures in short tons:

UNITED STATES

Production:	Sept.	Oct.	Jan.-Oct. 1951	Jan.-Oct. 1952
Crude, primary	(a)79,053	81,935	801,290	802,570
Crude, secondary	3,373	2,418	50,840	39,173
	82,426	84,353	852,130	841,743
Refined	98,930	105,770	997,638	975,072
Deliveries, refined	(a)135,486	136,964	1,124,564	(b)1,175,543
Stocks at end, refined	(c)71,456	(c)59,760	78,192	(c)59,760

OUTSIDE UNITED STATES

Production:	Sept.	Oct.	Jan.-Oct. 1951	Jan.-Oct. 1952
Crude, primary	(a)124,230	109,001	1,146,231	1,167,968
Crude, secondary	(a)1,184	1,334	4,467	6,656
	125,414	110,335	1,150,698	1,174,624
Refined	96,511	90,720	1,012,696	1,008,843
Deliveries, refined	83,784	85,754	811,873	849,153
Stocks at end, refined	157,450	143,872	170,477	143,872

(a) Corrected. (b) Includes tonnages delivered from Government stocks. (c) Include tonnages delivered to U.S. consumers at foreign ports.

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Materials. Delivered prices in effect as November ended were as follows:

COPPER:	Per Long Ton £	s.	d.
Electrolytic, high conductivity	285	0	0
Fire refined, high conductivity	285	0	0
Fire refined, high grade	284	10	0
Fire refined, min. 99.7 percent	284	0	0
Fire refined, min. 99.2 percent	283	10	0
ZINC:			
Foreign (G.o.b.) duty paid	110	0	0
Domestic (G.o.b.) duty paid	110	0	0
Prime Western and debased	110	0	0
Refined and electrolytic	114	0	0
Minimum 99.99 percent	116	0	0

Lead: Trading in lead on the London Metal Exchange was resumed on Oct. 1, on which date fixed quotations by the British Ministry of Materials were discontinued.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

November 29, 1952

Aluminum ingot, 99 plus percent, lb. (effective Aug. 4)	20c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	37.97c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb	$2.40
Germanium, lb.	$340.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$9.85 @ $11
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$209 @ $211
Selenium, 99.5 percent, lb	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 percent, lb.	$5.00

(a) includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$45.00 @ $47.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $28.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $56.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$9.45
Mesabi bessemer	$9.20
Mesabi, non-bessemer	$9.05
Lead (Galena), 80 percent, Joplin, Mo_3 ton	$180.90
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.20 @ $1.22 c.i.f. U.S. ports, duty extra. Long-term contract nominal at 90c. to 93c., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.50 @ $3.00
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, f.o.b. foreign ports	$52.00 @ $54.00
Domestic, scheelite, 60 percent f.o.b. mill	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$84.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5¾c
Cobalt Oxide, 72½ to 73¾%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$8.95 @ $9.95
Germanium Oxide, lb.	$142.00

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$ 225
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.85
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	11.4c.
Spiegeleisen, per long ton. 19 @ 21 percent grade	$85.00

NON-METALLIC MINERALS

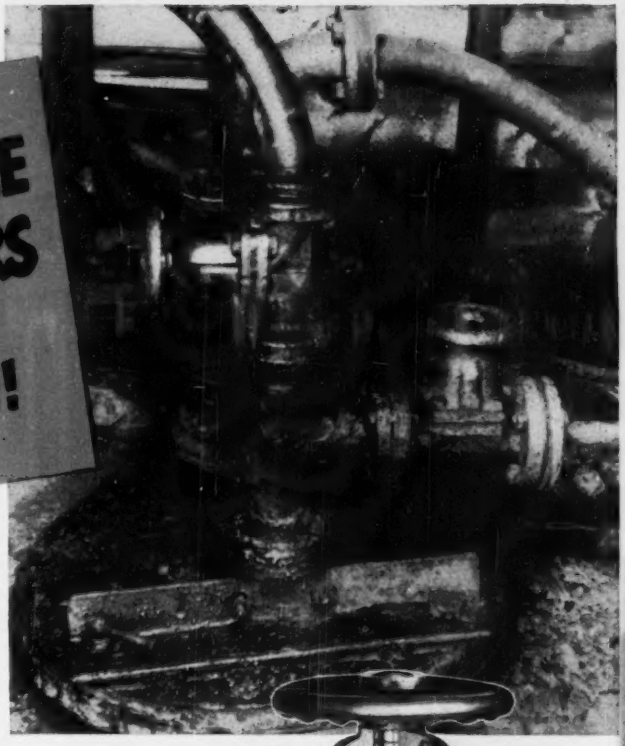
Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$320 @ $515
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Flourspar, f.o.b. mines, bulk, 70% effective ton	$43.00
60% effective CaF_2	$40.00
Acid 97% concentrate, bulk, ton	$60.00
Fuller's earth., f.o.b. Georgia or Flordia, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

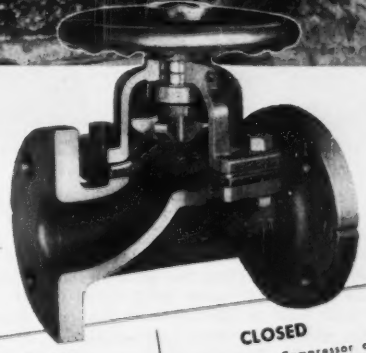
Pig iron, gross ton, basic, Valley furnaces	$54.50
Steel, f.o.b., Pittsburgh billets, net ton	$59.00
Structural shapes, 100 lb.	$3.85

TROUBLE FREE FOR 15 YEARS handling muriatic acid!



Another 'open and closed' case for

GRINNELL-SAUNDERS DIAPHRAGM VALVES

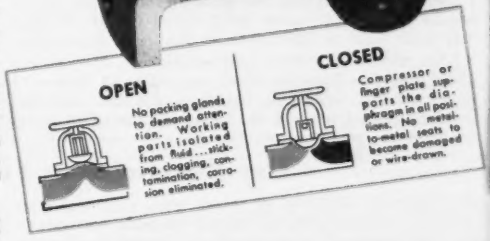


In 1936, a Canadian mine installed Saunders Diaphragm Valves with rubber linings on the feed and drain piping of an underground tank used for the storage of muriatic acid. Today, after 15 years, those *same* valves are in use—having required no maintenance except for periodic replacement of diaphragms, a simple operation done without removing the valve from the line.

Grinnell-Saunders Diaphragm Valves are available in many different combinations. Bodies are made in a variety of metals —iron, stainless steel, bronze, aluminum and others. ***But of more importance*** is the fact that a body of cast iron (a metal not in short supply) can be lined with glass, lead, natural rubber, neoprene and other materials which, in many instances, handle corrosive fluids *better* than metals.

Diaphragms come in natural rubber, neoprene, butyl, hycar, a special synthetic for foods and KEL-F. This last is chemically inert to all acids and alkalies in all concentrations with the exception of molten alkali metals.

From this broad selection of materials, the problems which the Grinnell-Saunders valve can solve are extremely varied. No wonder industry after industry is putting it on the line.

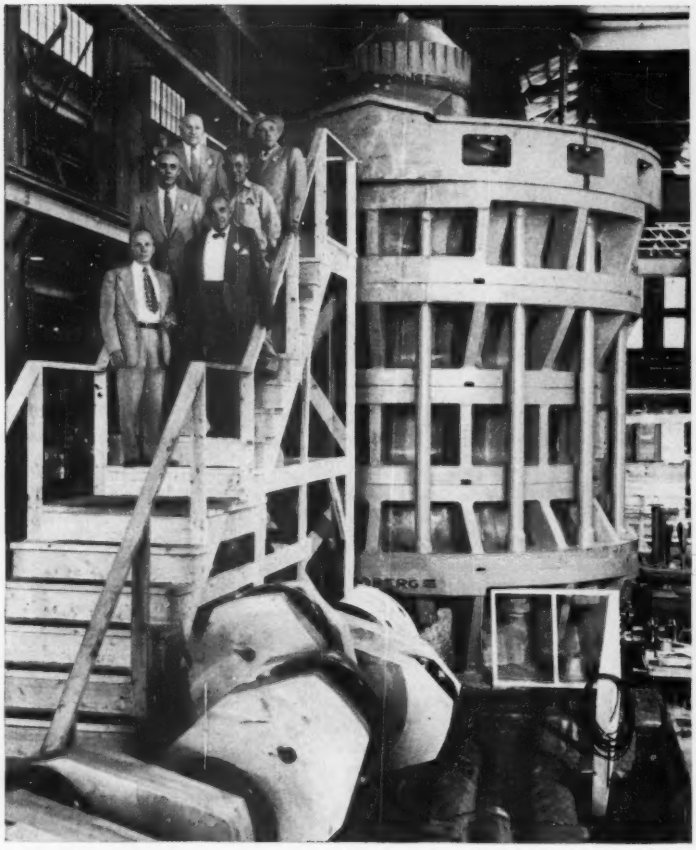

OPEN
No packing glands to demand attention. Working parts isolated from fluid...sticking, clogging, contamination, corrosion eliminated.
CLOSED
Compressor or finger plate supports the diaphragm in all positions. No metal-to-metal seats to become damaged or wire-drawn.

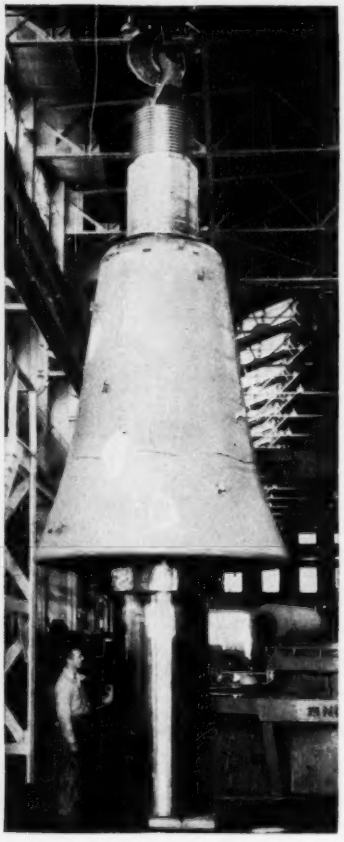
GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies industrial supplies • • Grinnell automatic sprinkler fire protection systems • • Amco air conditioning systems





World's Biggest Primary Gyratory Crusher

Twelve special, heavy-duty railroad cars carried it in pieces to Climax, Colo., for assembly in Climax Molybdenum Co.'s Storke Level plant. Called the 60" Symons, this giant built at Milwaukee by Nordberg Manufacturing Co. weighs more than 1-million lb., is 27 ft. high and about 19 ft. in diameter. Feed opening is 60 inches. At upper left are, reading up the steps, alternately left and right (beginning left) H. M. Zoerb, administrative manager of Nordberg's Crusher and Process Machinery divisions; and Climax officials: W. J. Coulter, vice president; A. Stazicker, purchasing agent; M. Dessau, mill superintendent; R. R. Shafter, Process Machinery Division vice president, and C. J. Abrams, manager. Foreground, same picture, shows crankshaft for 10,800-hp. Nordberg diesel. At right is shown the 92-ton main shaft. Allis-Chalmers is building another 60 in. gyratory crusher for Reserve Mining.

Dry Beneficiation For Potash, Phosphate

DRY BENEFICIATION of potash, phosphate, and other ores—the process requiring neither reagents nor water—has been developed by International Minerals & Chemical Corp., the company's president, Louis Ware, announced. The ore is ground and dried, then given a simple and inexpensive treatment. Final step is separation of mineral components between electrodes.

"This new process results," said Ware, "in a great economy in comparison with any other present methods."

The new method has been named the LeBaron-Lawver process in recognition of contributions made to its development on the part of Dr. I. M. LeBaron, director of International's research laboratories, and James E. Lawver, of the company's research staff. Dr. Paul D. V. Manning, International's vice president in charge of research and one-time McGraw-Hill editor, directed the project.

Several patents protect the process and equipment. It has been developed only after many years' research at the company's Mulberry (Fla.) experimental station and pilot plants. Large quantities of potash ore were shipped for the experiments from Carlsbad (N. M.) in sealed containers.

Ware said plans are almost complete for building the first big potash-producing plant using the LeBaron-Lawver process, in the Carlsbad basin. The new process will also be used, he said, in continuous treatment of semi-commercial quantities of potash in a new and larger pilot plant to be built immediately at the site of the present Carlsbad refinery. The company plans to develop a new shaft and mine in its new orebody there.

THIS MONTH IN MINING

In Wake of Bolivian Coup

Lechín Tells World News Bolivia Asks Only "Good Faith"

JAIME SAENZ, McGraw-Hill World News

" . . . WE ONLY WANT cooperation," Minister Lechín, left, tells McGraw-Hill's Saenz.

LA PAZ, BOLIVIA—Characteristically tight-lipped Juan Lechín opened his doors to me to reiterate assurances that foreign capital and technicians are welcome in Bolivia and will be protected, and to make a plea for "good faith."

Boss of the Ministerio de Minas y Petróleos created by the government that came to power in the April revolution, Lechín is shouldering responsibility of managing mines of the "Big Three" tin producers—Aramayo, Hochschild, and Patiño—that were seized by the Estenssoro Government.

Hallmarks of History

From his office on the fourth floor of the ministry building on the corner of Calle Bueno and Avenida Camacho, where the interview was conducted, there were everywhere apparent the signs of change and the drama of history in the making. Just across the street is the La Paz headquarters of Hochschild. A stone's throw away, one sees the Aramayo Mines building, and 2½ blocks distant stands the former home of *La Razón*, daily morning newspaper that was owned by Compañía Aramayo. Three blocks from the ministry, facing one another across a street, are the American Embassy and the Patiño Mines building.

On all these since Nov. 1, big posters, reading "CORPORACION MINERA DE BOLIVIA," have been reminding the people that the long-sought social upheaval has at last been consummated.

"As you probably know," the cautious Lechín began, "the Bolivian nation has entered on a new stage of her history. We have nationalized the three big groups of tin industry in order to improve the living standards of the people, give them a decent life, increase the production, and make stable the general social conditions.

"Foreign Investments . . . Are Guaranteed"

"All foreign investments in Bolivia are guaranteed by the government, and also all the American personnel at the mines are guaranteed. I want to say that the miners' reactions against the management were not against the United States' citizens, but against the strangling oligarchy represented by (the three tin concerns seized by the government) . . ."

He said the Corporacion will contract through a UN agency for technical assistance of 12 experts: two each of production engineers, electrical engineers for production and traction, diesel engineers, and mining construction engineers; geologist, mining machines engineer, metallurgical expert on melting of nonferrous metals, and an expert on administrative organization, one each.

As he walked me to the door, shaking my hand, the minister said, in his always intensely serious manner:

"You know, Bolivian people have been always friendly to the brothers of the Hemisphere, and we only want cooperation and understanding. As I before said, all foreign investments are guaranteed in Bolivia. What we want is good faith. . . .

"We do expect foreign investments. They have all guarantees in the new democratic regime of the State of Bolivia."

As I take my leave, I see I've been privileged to take the time of an extremely busy man. The anteroom is crowded with people who will have the minister's ear before this day is done—working miners, economists, members of Movimiento Nacionalista Revolucionario, engineers, the man on the street.

Lechín, who is only 39, stands 6 ft. and weighs 181 lb. His dapper dress belies early years of hard manual labor in the mines and voluntary military service that won him two promotions in the Chaco war. His fluent English he acquired at the American Institute, where, incidentally, he distinguished himself as a skillful baseball player.

Future of Bolivian Tin Mines Doubtful Under Present Management

PAT REED, *E&MJ* Staff

SIX ENGINEERS formerly with the Aramayo interests recently came together at a New York press conference to present their views on the expropriation of the "Big Three" properties in Bolivia. The meeting was arranged by a public relations representative of the Aramayo and Hochschild interests.

The six left Bolivia voluntarily and independently of each other, after being offered inducements and compensations by the government to stay. Only eight of the total 35 engineers now remain at Aramayo, with four doubtful and four Bolivian nationals who have no choice but to continue with the company. This is the case in all Bolivia, state the engineers: 80 to 90% of all foreign personnel leaving!

Scapegoats Will Be Wanted

Set forth as the reason for mass resignation is "workman's control," a system by which a union-elected man is put in authority over technical and administrative personnel. This control of the mines by untrained men, if allowed to continue, can only result in production slowdown or eventual cessation. Foreign personnel, it was said, doesn't want to be on the receiving end when the angry government finger is pointed.

"I hate to leave. I have a great many friends in Bolivia after nine years, but it's just impossible to stay under government and 'workman's control'," said one engineer. In the whole country there now remain about nine Bolivian technicians, without supporting staffs; this in a coun-

try where 80% of the people live directly from the mines!

Corporacion Minera Boliviana, government agency now in charge of the Aramayo, Hochschild, and Patiño interests, may find a little trouble if it does not back up its promises to the people. The miners, used to a higher living standard inside the mining community, say the engineers are hungry for the fruits of nationalization.

Controlling the mines is Movimiento Nacionalista Revolucionario (political) and Control Obrero Boliviana (union). The workmen, many said to be armed, are the most powerful faction in this country, where discipline is now completely lacking.

The opinion was put forth that our State Department's tin dealings were not, as had been questioned, reason for nationalization. Decrees for the movement had been pending for years.

Bolivia may, it is felt, weaken on her demand of the "Big Three" for $520-million in back taxes if a little State Department influence is brought to bear on the Estenssoro Government.

As to the outlook, Bolivia needs dollars. Dollars must come from her mines, whose future is questionable. Though it is doubtful that a foreign interest will ever again own land outright in the country, mine contracts may be let in the future.

The six engineers putting forth the counter to press reports were: Henry Morissette, Timmins, Ont., Can.; N. M. Kay, London, Eng.; W. R. Ziebell, Beloit, Wis.; D. A. Motycka, Leigh, Neb.; R. J. McCrary, Rapid City, S. D.; and D. Kochersperger, Greenwich, Conn.

Bolivia Won't Pay, Stockholders Told

THEIR CHAIRMAN told Patiño stockholders the Bolivian Government would rationalize bookkeeping in order to evade payment to the "Big Three" tin companies in compensation for seized property.

"Although the Bolivian Government has stated its intention to compensate your corporation and the other two mining groups in Bolivia for their seizure," wrote Joseph C. Rovensky, chairman of Patiño, in a letter to the company's shareholders, "reports from there indicate that the government is contemplating fantastic claims against your corporation and the other tin companies in an attempt to reduce payment of compensation."

"Big 3" Owes a Half-Billion?

IT ISN'T ANY LONGER a question—at least in Bolivian Government circles—how much Bolivia's banished tin producers are going to be paid for their confiscated properties. While a final settlement had not been reached by press time, Estenssoro's revolutionary government has made its opinion plain that the tin men will be lucky if they manage to get back a penny. The government's accounting looked about like this:

Combined Valuation	$ 21,725.000
Debt to Government	520,000,000
Net Owed to Government	Minus $498,275,000

The companies put their net worth at plus $60-million. The government estimated their value at $9.25-million for Hochschild, $7.5-million for Patiño, $4,976,324.82 for Aramayo, and claimed their profits from allegedly illegal foreign exchange deals and alleged income tax evasion are equivalent to a $520-million indebtedness to the government. Said President Estenssoro: "The companies must first pay what they owe."

The provisional decree allows the "Big Three" 3% interest on their (government-estimated) assets until a final settlement is arranged. Year's-end 1953 has been set as the deadline for final settlement.

Here's Haystack Mountain's New Uranium Producer

SHATTUCK DENN'S uranium operation. Chute at right feeds ore to trucks shuttling on road running up from foreground. At left, a Caterpillar Diesel D4's Trackson HT4 Traxcavator shovel clears road and disposes of waste.

SHATTUCK DENN MINING CORP. has recently undertaken exploration and development of a uranium property in the Haystack Mountain area near Grants, N. M. Shattuck Denn's lease comprises about 480 acres. It partially adjoins extensive holdings of Anaconda Copper Mining Co. and Santa Fe Railroad Co. Shipments of ore have already been made to Anaconda Mining Co.'s sampling plant at Bluewater, where crude ore is stockpiled pending completion of the mill now under construction.

The deposit Shattuck Denn is developing is a gently sloping stratum called Brushy Basin. This bedded lense is one of the uppermost members of the Morrison sandstone, one of three Jurassic sedimentaries comprising the Zuni uplift in the southeast corner of San Juan Basin. The sediment is geologically anomalous, since neighboring ground is predominantly limestone.

Overburden has been bulldozed from the sandstone stratum for a distance of 7,800 ft. on the mountainside, and to date seven adits ranging in length from 50 to 120 ft. and spaced at 50-to-200-ft. intervals have been driven underground.

Ore occurs in lenticular pods. T. W. Newell and Frank Garrett are in charge.

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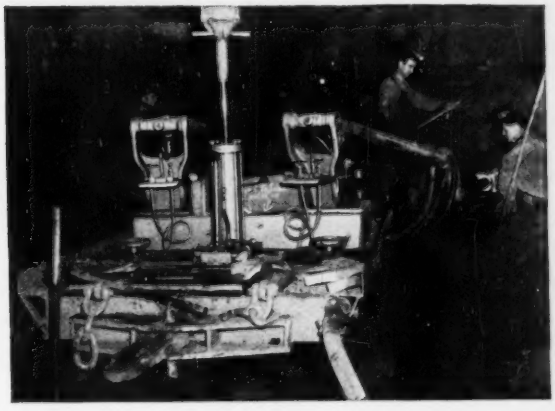

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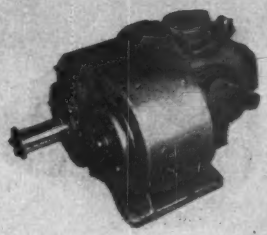

Eimco Geared Air Motors are husky, powerful units built to work on a continuous operating basis with a minimum of attention.

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Power units are Eimco 5 cylinder, radial-type, reversible air motors. These motors have a high starting torque and work efficiently on pressures from 40 to 125 p. s. i.

Eimco Geared Units are available in three sizes, conservatively rated at between 7½ to 17 h.p., each with four different speed ratios.

Eimco Geared Air Motors are the only completely safe, completely dependable units.

Write for Bulletin AE6001.

EIMCO

THE EIMCO CORPORATION

W. P. MORRIS, left, takes the gavel and presidency of New Mexico Mining Association from John A. Wood, retiring president, as their organization and the Southwest International Mining Association meet jointly for the first time.

Fluctuating Prices, High Taxes Deplored At First Southwest Mineral Conference

FREMONT KUTNEWSKY
E&MJ Correspondent

The first annual Southwest Mineral Conference—co-sponsored by New Mexico Mining Association and Southwest International Mining Association—was held at Albuquerque, N. M., Nov. 6, 7 and 8, more than 600 delegates attending.

Problems of the mining industry in the Southwest which received prime emphasis by speakers were: (1) fluctuating prices such as are at present shutting down zinc and lead properties; (2) taxes that deprive corporations of surpluses that ought to go into exploration and development, and (3) more exploration to discover mineral deposits in the Southwest, especially of the newer types of ore now in demand.

Robert S. Palmer, executive director, Colorado Mining Association, in his keynote address at the opening session, blamed the plight of the mining industry on lack of proper legislation in Congress and inadequate policies of the State Department in foreign affairs.

"We want to see international trade go forward and foreign nations prosper," he said, "but there are better ways than to make policy on the false foundation of the Paley Report, which does not jibe with the true situation in this country.

"Our experience in World War II was one long story of 'too little—too late.' Production of essential minerals was handicapped by loss of workers to other industries; the freezing of miners on jobs was unpopular; purchasing depots were not very effective. Things would have been much worse but for the fact that many mining companies boosted production on their own initiative.

"If we are attacked again, it may be quick and possibly decisive, and we'll have little time to prepare. Imports may be shut off. Congress has recognized the principle of non-dependence on foreign ores, and the Department of Defense says that a strong mining industry is in the interest of national security; but, though many members of Congress are in favor of legislation to carry out these ideas, it hasn't been forthcoming.

"Tax relief for small miners, to encourage mining and broaden the base of taxation would actually bring more revenue. Legislation could have prevented the present situation in lead and zinc. Mining men in western states should speak out, get off the defensive. We must reverse the present trend and adopt a constructive program."

Otto Herres, vice president of Combined Metals Reduction Co., of Salt Lake City, took a similar stand. He said "our assistance to low-wage foreign production of metals in competition with domestic mining" was a serious menace to the mining industry in this country. He noted a reduction of 1100 miners employed this year as compared to last, in New Mexico.

Commodity Credit Proposed For Mining Industry

Senator Clinton P. Anderson, of New Mexico, in a luncheon talk suggested a commodity credit corporation for the mining industry like the one for farm surpluses "to assure mining firms of financial assistance if ever overproduction should lower prices." Sen. Anderson was formerly secretary of agriculture in the Truman cabinet.

James Boyd, formerly with the Bureau of Mines and now vice president in charge of exploration, Kennecott Copper Corp., called for a division of labor between small and large-scale mining companies and suggested tax measures and an economic climate to aid both. He said that, while a small company can't go in for mining iron ore, there are many opportunities for small companies to mine newer minerals often available in high-grade ores. Also, he said, there are opportunities for surface exploration of fissionable minerals, many nonmetallics, and rare earth minerals.

W. B. Dancy, development engineer, International Minerals and Chemical Corp., described new development by potash-mining companies in southeastern New Mexico, where three of the major operators are exploring new deposits discovered in Lea County, New Mexico's oil county. He said this may become a large enterprise.

Ernest W. Ellis, chief of Rare and Miscellaneous Metals Division, Defense Materials Exploration Administration, deprecated the small number of applications from New Mexico for federal assistance in developing production of new, rare minerals for which demand is rising.

J. B. Knaebel, in charge of uranium operations at Grants, N. M., for Anaconda Copper Corp., briefly outlined the history of the Grants uranium district, where the first discovery was announced in late 1950. He said his company is well along in building a treatment plant and affiliated facilities at Bluewater under contract with AEC. He said there has been considerable flighty high-grading of surface deposits and that the ore is generally of low uranium content; also that the outlook depends largely on future discoveries in the Morrison and Dakota sandstones and possibly other formations, which means concentration on underground mining.

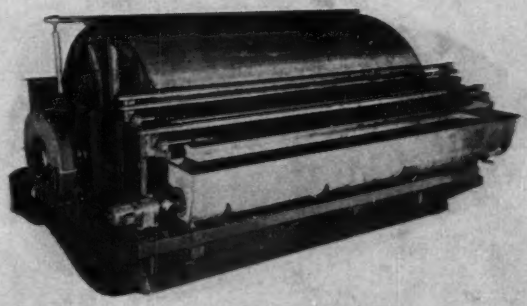
Session chairmen were: Dr. Eugene Thomas, dean of engineering, Texas Western University; A. J. Thompson, head, department of mining and metallurgy, New Mexico Institute of Mining & Technology; Vernon L. Mattson, director, Colorado School of Mines Research Foundation; Dr. Eugene Callaghan, director, New Mexico Bureau of Mines; Dr. Stuart Northrop, head, department of geology, University of New Mexico; Bill Allport, of USGS, Carlsbad, N. M.

John A. Wood, of Chapman & Wood, mining engineers, president of the New Mexico Mining Association, and Ben Roberts, American Smelting & Refining Co., president of the Southwest International Mining Association, generally supervised the convention, which was in effect a wedding between their two organizations.

Morris Succeeds Wood As NMMA President

Election held by the New Mexico Mining Association established the following officers:

EIMCO String Discharge FILTERS



Eimco String Discharge filters are furnished where the nature of the cake makes the use of the string, to lift off the cake, a more desirable feature.

Eimco String Discharge attachments are available for high or low submergence drum filters in a full range of drum size from 25 to 678 sq. ft. of filter area and in laboratory size the Eimco String Discharge filter is proportionally designed with 4 sq. ft. of filter area.

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YE GOOD KING WENCESLAUS
by YE GOOD SAINT "VIC"

Sad King Wenceslaus looked out
At the royal piping,
Faulty lines lay all about
(Those leaks and breaks were griping!)
Then he saw with much delight
What was in his stocking,
He found Couplings sure leak-tight
(Victaulics famed for locking!)

"Ah! Victaulic Fittings, too,"
Roared the King now smiling,
"Elbows, Tees all grooved and true,"
(And Full-Flow in their styling!)
Good Saint "Vic" was in the know,
Vic-Groover tools were waiting,
Kingly smiles began to grow
(Their grooving's tops in rating!)

Zip! The King hooked up those sections,
Saint "Vic" did him rightly
With these very best connections
(No leaks and drips unsightly!)
For a Method that's complete
Wenceslaus is liking
Easiest way to make ends meet
(Victaulic's Four Star Piping!)

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Mineral Conference *(Continued)*

W. P. Morris, manager of Duval Sulphur & Potash Co., of Carlsbad, raised from first vice president to president; Carl S. Elayer, Elayer & Co., Silver City, first vice president; A. J. Thompson, second vice president.

New three-year directors: W. C. Waidler, of Vanadium; A. L. Greslin, of Molybdenum Corporation of America, Questa; W. D. Stone, of Great Lakes Carbon Corp., Socorro; G. R. Griswold, of Potter & Sims, Albuquerque; R. R. Davis, of Silver City, and Knabel—all of New Mexico. Also, representing the suppliers: J. J. O'Connell, Machine Engineering Corp., Albuquerque; Elmer Skinner, Mine Supply Co., Carlsbad, and R. S. Pettijohn, of Hanover.

Re-elected to the board: J. A. Freeman, Jr., of Pumice Corporation of America, Grants; E. C. Iden, of Albuquerque, Atchison, Topeka & Santa Fe Ry. Solicitor; Vincent C. Kelley, University of New Mexico, Albuquerque; Horace Moses, of Santa Fe; Ben Shantz, attorney, of Silver City; J. H. Taylor, Peru Mining Co., Silver City; George A. Warner, Shattuck-Denn Mining Corp., of Albuquerque, and John Wood, the organization's retiring president.

Main social events were the annual Grubstake Supper and the annual banquet.

Delegates were taken on a field trip to Sandia Base, AEC Special Weapons Project, and Kirtland Air Force Base, where the newer weapons are prepared and training in their use is given.

Private Hoards Hold $700-Million in Gold

PRIVATE GOLD HOARDS in the form of bars, sheets and coins, continued to increase and rose to an all time high during 1952, according to Franz Pick, noted gold authority. Approximately $700-million, corresponding to 20-million oz. at the official $35 price, have found their way into the hands of private owners. Total world production was about $830-million during the last 12 months. French gold hoards decreased from $4.1-billion to $4-billion, whereas holdings in other European countries, principally Switzerland, Italy, and Germany, increased the European total by $100-million.

Asiatic hoards increased by $200-million. Japan, India, and Kuwait absorbed most of this increase. African holdings gained about $100-million to $1.9-billion. Egypt, Morocco, Tunis, and South Africa shared in the increase.

A rise of 33%, from $900-million to $1.2-billion, took place in the Western Hemisphere. Private buyers in the U.S., Mexico, Cuba, Brazil, and Uruguay were principal customers.

Not included in this survey are existing private gold stocks in Red China and the Soviet Union and its satellites.

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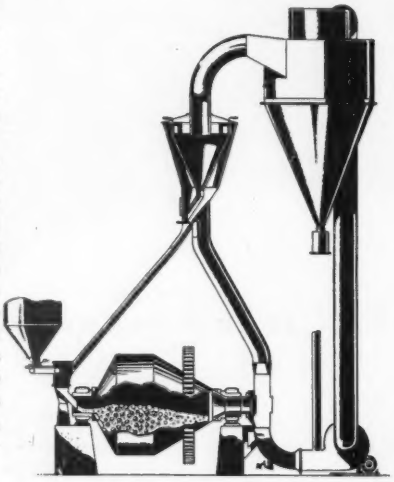
HARDINGE CLOSED-CIRCUIT DRY-GRINDING SYSTEM

One of the preferred dry-grinding arrangements is the closed grinding circuit illustrated here: The Conical Mill has a gravity overflow discharge. The product is pulled into the vertical air stream at the mill discharge due to a drop in air pressure at this point. The Hardinge Air Classifier separates a product as fine as 99½% passing 325 mesh or as coarse as 35 mesh if desired, returning the oversize to the mill.



The entire system is closed, except for the feed end of the mill. A negative pressure is maintained in the air conveying system which makes the entire operation dust free.

HARDINGE

NEWS BRIEFS

German lead-zinc producers are hollering for duties and restrictions to shield them from effects of price declines here. (Germany has in recent weeks dumped about 10,000 lb. of copper on the U. S. market at slightly less than the market price.)

•

Metal with a memory: Thomas A. Reed, Columbia University metallurgy student, has discovered an alloy of gold and cadmium that is easily bent when cold but always regains its original shape upon heating to 150 deg. F. Now Mr. Reed wants to know what it's good for.

•

Privately minted coins have been bringing premium prices and problems to European producers. In one month, they turned out three models of the British sovereign and marketed them at three prices. It all depends on the image the coin bears. Athens, for example, quoted $11.10 for sovereigns commemorating Queen Victoria, $10.85 for Edward VII's, $10.80 for George V's, while "old" coins brought $11.90. Saudi Arabia bought and paid for, then refused to accept, 60,000 George V's. Grounds: The money manufacturers twisted the monarch's ear.

•

Miners of Northern Rhodesia's four principal copper producers—Mufulira, N'Changa, Roan Antelope, and Rhokana—went back to work after striking three weeks. Cost in output was about 21,000 tons of copper.

•

The 360-mi. rail line linking the rich Ungava iron country and Seven Islands on the Gulf of St. Lawrence will be completed next year, one year ahead of schedule. Canadian Premier Duplessis said track now runs 135 mi. inland, and an additional 40 to 50 mi. has been graded. Elevation from sea level is accomplished in the first 100 mi.

•

Sulphur de-control was cited by L. M. Williams, Jr., Freeport Sulphur Co. president, as "an important step toward the return of a free economy."

•

Diminution of ore reserves in the iron country—accelerated in the past generation by two world wars and the war in Korea—depresses assessments and forces mining towns in Michigan and Minnesota to look for tax revenue from other sources. Ironwood, biggest community in Michigan's Gogebic County, is a case in point. Iron mines once contributed 90% of Ironwood's tax revenue, in 1932 paid 77% ($371,602) this year will account for only 39% ($122,258 from three companies). (Michigan has no legal restrictions similar to those which limit local taxation of mines in Minnesota.)

Chairman Sabourow, of the USSR's state planning commission, was quoted in *Pravda* saying the Soviet would increase output of aluminum 2.6 times, lead 2.7 times, and zinc 2.5 times by 1955.

•

Aluminum Ore Co., which heretofore produced synthetic cryolite only for its parent, Alcoa, will expand facilities at East St. Louis to increase output 11,000 tons a year and sell 42,600 short tons to the government by the end of 1956. Base price of 13.9¢ a lb. has been guaranteed. Concurrently, DMPA announced signing of a contract to increase U. S. supply of natural cryolite, found only in Greenland, by 13,700 tons.

U. S., Alcan Make Big Aluminum Deal

DPA'S COMMITMENT to borrow an additional 44-million lb. of Alcan aluminum from Great Britain followed hard on the heels of Deputy Administrator for Aluminum Anderson's statement that "no such (formal) contract for larger imports (from Canada) is contemplated at this time."

The new loan, to be consummated in the four months December through March, and concomitant cancellation of the scheduled repayment of 33-million lb., previously loaned to Britain, bring to 77-million lb. the projected additional indebtedness calculated for the end of the first quarter of 1953. Total debt will then be 99-million lb. The new schedule calls for repayment of 22-million lb. in the second quarter and postpones paying off the balance until 1954 and 1955.

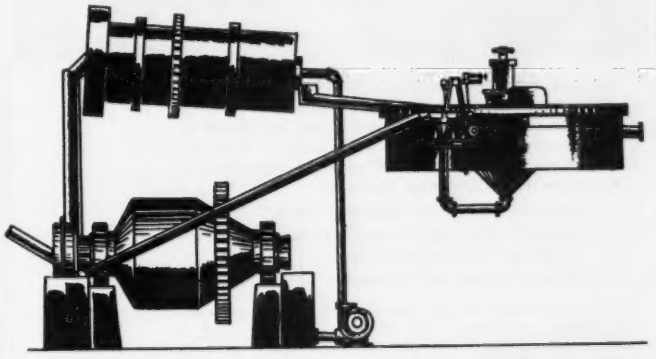
Anderson said shortages of hydroelectric power in the Northwest and the Tennessee Valley made the deal imperative.

When he announced Oct. 1 that the government's target for aluminum production was upped 200,000 short tons a year, he called attention to a report of the Joint Committee on Defense Production. It urged any additional supply necessary be obtained from independent (preferably nonintegrated) U. S. producers and recommended no formal contracts be made for additional imports from Canada.

Accelerated expansion raises the goal from 1,546,000 to 1,746,000 short tons primary production by 1955. Added to anticipated scrap production and imports, total available by that time is estimated at 2,375,000 short tons a year. Comparable figures for 1950 give 719,000 short tons (primary) and 1,206,700 short tons (total available).

Giving assurance DPA would "attempt to secure this expansion from new domestic producers," Anderson said it was hoped the program could be carried out without resort to government loans or financial guarantees, except for the granting of accelerated tax amortization.

HARDINGE CLOSED-CIRCUIT WET-GRINDING SYSTEM



The Hardinge wet-grinding circuit illustrated here is capable of producing an end-product in the range of 28 mesh without Hydro-Classifier and as fine as 10 microns with Hydro-Classifier. It provides positive control of sizing and moisture.

The Conical Mill discharges to a Counter-Current Classifier which returns the oversize by gravity to the feed end of the mill for regrinding. For ultrafine products, the Counter-Current Classifier product goes to a Hydro-Classifier for further separation. The oversize is returned to the mill or used as a secondary, uniform product. Bulletin 39-B-1.

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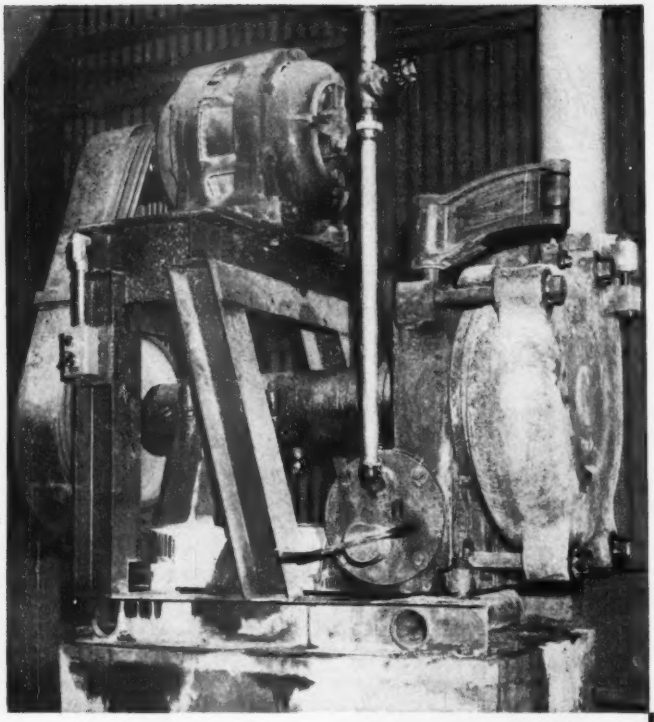

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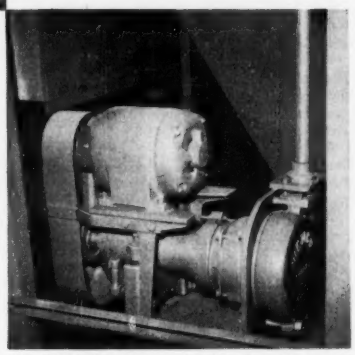

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North American Zinc-Lead Mines React To Depressed Market By Shutting Down, Curtailing Production

E&MJ Correspondents
In The Field

PLUMMETING zinc and lead prices have forced producers all over North America to the wall.

Reports coming in from the western states and throughout Canada tell of shutdowns on the part of many of the smaller producers. Others, pinched as well by rising costs, tax demands, and depletion of better-grade ores, are curtailing operations or making plans to shut down should the expected further decline in prices materialize.

In Mexico, where production is sensitive to U. S. price trends because of the large volume of export business carried on with this country, the effect has been damped, but Mexican producers look to 1953 with apprehension.

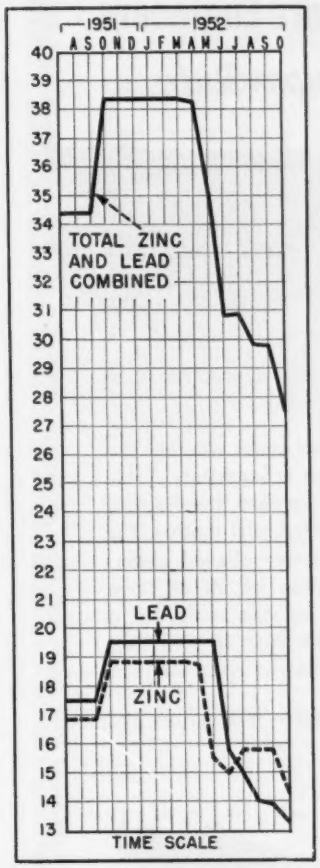
Jess Larson, DMPA administrator, said nothing short of substantial increases in prices of lead and zinc in the very near future can forestall further cutbacks.

"The freeing of the London lead market and the report that the British Government contemplates removing its controls over the zinc market about the first of the year," said Larson, "have had the effect of creating an unofficial surplus of the two metals. Actually, there is no surplus of production. On the contrary, unless production of both lead and zinc can be maintained at the level that prevailed previous to the recent price decline, serious shortages are almost certain to develop next year. . . . Obviously, we will be confronted with serious shortages if the production contemplated in these programs (Government plans to expand lead output 2% by 1955 and zinc output by 15% in the same period.) is substantially reduced for any considerable period of time."

By way of reply to what he said were many inquiries expressing "great concern throughout the domestic industry," Larson said, "It is my hope that the situation will right itself in the near future. If it does not, every possible remedial measure will be taken to assure production of needed supplies of lead and zinc for the defense program and necessary civilian use."

Two new base metal mines in British Columbia boldly announced plans to meet the price slump by boosting production in order to cut costs. **Estella Mines, Ltd.**, will issue an extra $0.5-million worth of stock to finance development of its properties near Wasa in the Kootenays and thus increase mill production to 250 tons daily, compared to current output of 150 tons. **Kootenay Base Metals**, which recently was considering whether to close operations near Fort Steele, decided to secure new financing and increase both ore reserves and milling rates.

(Scope of the situation was by no means confined to the Western Hemisphere. For example, a French lead smelter, in response to a recent cut in London's lead prices, cut the price of primary lead, effective Oct. 28, from 117 to 105 francs per kilo. Price in London continues highly unstable.



DOWN THEY GO, crowding zinc-lead producers to the wall. Graph shows prices from month to month against a vertical scale calibrated in cents.

The situation state by state and in Canada and Mexico, shapes up as follows:

Arizona

St. Anthony mine, one of the oldest operations in the state, shut down in the face of falling prices and because of operational difficulties. The operator said the shutdown may be permanent because ore is playing out and the shaft is so deep that water must be pumped at the rate of 5,000 gpm. The mine originally was worked for gold.

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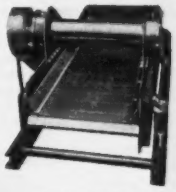

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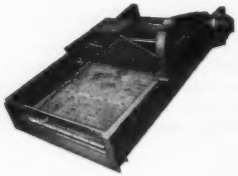

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Lead-Zinc *(Continued)*

California

Operators of **Coronado Copper & Zinc Co.'s Afterthought mine** at Ingot, Shasta County, attributed suspension of operation to exhaustion of ore reserves. The company continues to diamond drill areas lying outside current mine workings, but so far no additional ore has been found. Underground equipment is being removed, but the company is leaving the mill intact for the time being.

Anaconda Copper Mining Co.'s Darwin mines are feeling effects of current low prices and continuing labor shortages. Current daily production is 300 tons of lead-zinc sulphide ore, 120 tons of lead oxide ore, and from 10 to 20 tons of straight shipping ore. **Anaconda's Shoshone unit** at Tecopa shut down on account of ore-reserve depletion and isn't expected to resume operations unless new high-grade ore is found.

Colorado

Supt. William Klein, following a meeting with executives of **American Zinc, Lead & Smelting Co.**, announced American's **custom mill** was closed down at the end of October on account of the price picture, re-evaluation and consequent greatly increased tax loads, abandonment of the **railroad**, and high power costs attributable to the limited quantity of ore handled. The mill served mines near Ouray for nearly a quarter-century.

Idaho

Only one operation in the Coeur d'Alene mining district, **Signal Mining Co.'s** relatively minor operation at the old **Hilarity mine**, had suspended business at *E&MJ* press time. **Mines in the Pine Creek area** were hardest hit, but all were trying to hang on in the hope of an upturn, even though their profit margins were extremely small and in some cases nonexistent. Apparently an important factor in their decision to maintain operation is the fact that most have a substantial DMEA project.

In the Boulder district, **Idaho-Custer Mines, Inc.**, shut down its **Livingston mine** when daily production fell below 125 tons. In addition to the price slump, dependence upon large reserves of marginal ore in old upper workings was cited. Twenty-two men were laid off, six retained. Idaho-Custer will try to develop better-grade ore on two levels below the 2200-ft. main-adit level.

Neither **Sullivan electrolytic zinc smelter** nor the **Bunker Hill lead smelter** has set a quota on shipments it will accept. The zinc plant was expecting another cut in its power supply, but it was not known whether dwindling power supply would change the picture with respect to shippers doing business with the zinc plant. The Bunker smelter is now taking some lead concentrates that were turned away by Cominco at Trail in

accordance with recently imposed restrictions.

There have been a few cut-backs in development programs, but the men affected have had little trouble in finding new employment since labor is still in short supply owing to favorable weather conditions. Men who normally take outside jobs during the summer have not yet returned to their customary winter jobs in the mines.

While price cuts would doubtless make serious inroads on profits, most large operators felt Uncle Sam would come out worse than they would.

Illinois-Wisconsin

Mining and milling companies in this district are clearly divided into two groups, local companies characterized by lack of capital, organization predicated on quick profits, and lack of long-range programs; and large concerns that have diffused into this area during and since World War II.

Local companies are severely affected. Closed are **George Baker Milling Co., Grant County Mining & Milling Co.,** and **Meekers Grove Mining Co.** Meekers Grove's plant is up for sale. Mifflin Mining Co. curtailed production from 400 to 100 tons per month, selectively restricted mining, and reduced all wages 15% when zinc dropped to 15¢ a lb.

Homestead Mining Co., bound by an RFC commitment and without a government purchase contract, had no alternative but to start operation.

The larger companies fared better. **Eagle-Picher Mining & Smelting Co.** compensated for a cut to one shift at its **Graham-Snyder mine** by treating ore from its **Birkett unit** and maintained mill output at pre-slump levels. Mining is restricted to higher-grade ore. A union contract prevents any wage adjustment.

Unaffected production or wage-wise was **Tri-State Zinc, Inc.,** where it was said, "The cream is gone, but there's the same old milk."

Calumet & Hecla's Calumet Division, Wisconsin branch, was likewise unaffected.

Vinegar Hill Zinc Co., subsidiary of Youngstown Sheet & Tube, was still in business at press time, but a shutdown was contemplated pending a meeting of Youngstown officials to determine future policy.

Of the large companies, Tri-State Zinc is generally conceded to have the best orebody and lowest-cost operation in the district. Vinegar Hill, on the other hand, is mining the leanest orebody and is consequently more adversely affected by the price decline.

Producers here are especially sensitive to zinc prices, lead being generally considered a by-product of zinc output. Blamed for the drop were imports of foreign metal, lack of available steel for galvanizing, and a combination of the two factors. Smaller operators in particular, expressed resentment of high taxes that produce revenue to subsidize foreign mines that depressed the domestic price, particularly since foreign mines are per-

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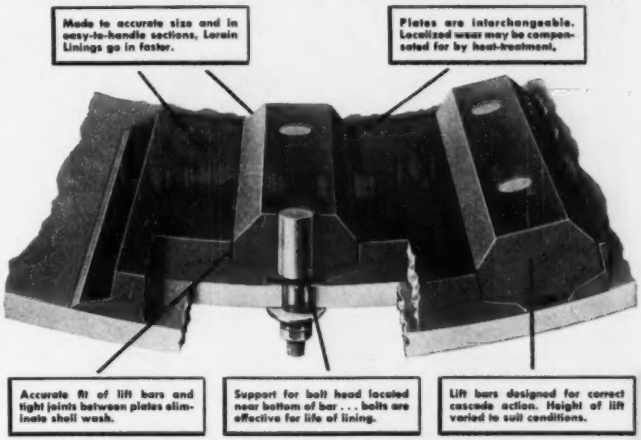
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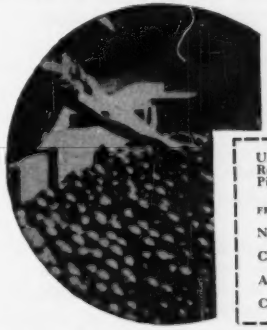

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Lead-Zinc (*Continued*)

mitted to operate without the 11 to 12% overhead attributable to government regulations here. One operator was infuriated by 17¢ purchase contracts held by American Zinc.

Ironically, while Homestead Mining got a large RFC loan and no purchase contract—and is obliged to commence operations—a Mr. Davis, of Linden, secured a three-year government purchase contract for zinc at 15¢ per lb. but was unable to obtain an RFC loan.

Montana

AS&R abandoned operations of its wholly-owned subsidiary, **Mike Horse Mining and Milling Co.**, and announced intention of removing parts of the plant but retaining title to the property. Depletion of ore of high enough grade to be profitable at present price and cost of production was given as the reason. The mill and mine, 53 mi. northwest of Helena, employed 85 men.

Nevada

Copper Canyon lead mine in Lander County dismissed 70 men and is being maintained by stand-by crews in order to minimize cost of reactivation should conditions become more favorable. Officials said increased freight, smelter, and supply costs made further operation impossible at current price levels.

New Mexico

Most smaller operators have closed down, and larger companies have curtailed operations.

Kennecott Copper Corp. closed two properties, but continues exploration in **Waldo No. 2 mine** in Grant County. Other large operators in the district have laid off men to cut down from a six to a five-day week.

Empire Zinc Co. closed its mine and mill at Hanover, and the **Nitt, Lynchburg, and Waldo districts** are being worked at curtailed rates.

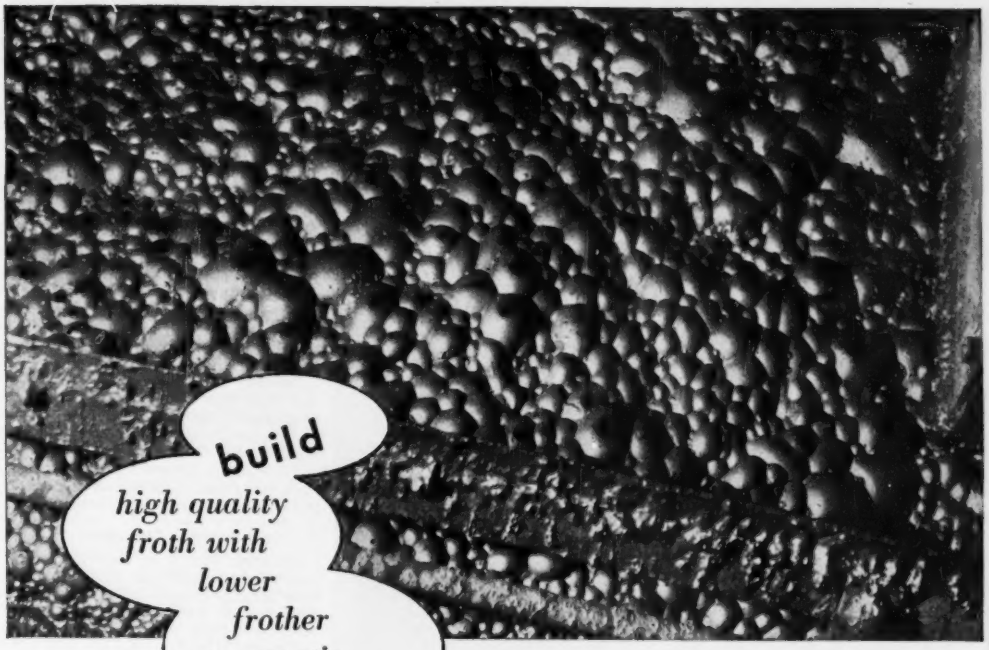
Anticipated further price declines for zinc are expected to lead to further shutdowns and curtailment.

Utah

Three of Utah's seven major lead-zinc producers are idle as a result of price declines, Miles P. Romney, Utah Mining Association executive secretary, reported. He predicted that the 51,800-ton output of lead in 1951 would be reduced by at least 12,000 tons this year.

Though payroll deductions in mills, smelters, and allied industries cannot as yet be estimated, 500 employees have been directly affected.

Mines closed are the **Park Utah Consolidated** at Park City, closed by strike last June 25 and never reopened, due to the incompatibility of resultant wage scale and current prices; **Silver King Coalition Mines**, Park City, closed due to prices, on Aug. 15, and **Horn Silver Mines** at Milford, closed early in September despite considerable investment in new development.



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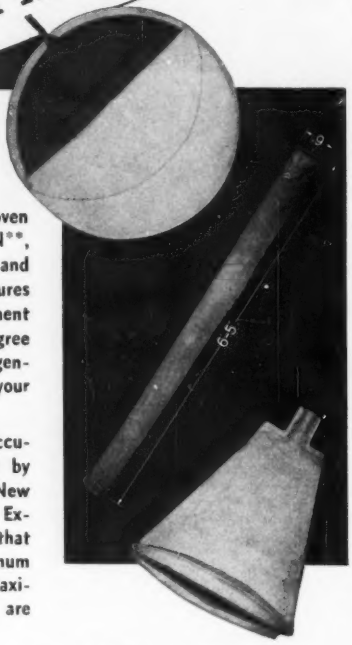

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Lead-Zinc *(Continued)*

Silver King sent ores to Leadville, Co'o., smelters. Others utilized Midvale facilities. Park Utah produced 400 tons of lead per month, Silver King about 330 tons, Horn Silver considerably less.

Still operating were **New Park Mining Co.** at Park City; **U.S. & Lark mines of the U.S.S.R.&M. Co.** at Lark and Bingham; **Chief Consolidated Mines Co.**, of Eureka, and some small lessees. Also active were **United States Smelting, Refining & Mining Co.**'s custom mill and smelter at Midvale, **International Smelting & Refining Co.**'s custom mill and smelter at Tooele, and **Combined Metals Reduction Co.**'s custom mill at Bauer.

Romney said this is another indication that the West's mines have no protection from foreign metals, especially when offshore producers wish to obtain dollar exchange.

"The entire picture," Romney said, "is a sorry one, operating as it does to the detriment of our own producers."

Eastern Canada

Canadian output of both lead and zinc will be up this year, zinc to an all-time tonnage record, but the value of both will be well under the amount rung up in 1951.

Exports of both metals are well up, too, while home consumption is down.

As a result, producers of both metals are going about their year-end business with an attitude of cautious uncertainty. The atmosphere of optimistic confidence evident a year ago has been diluted with the disappearance of high and urgent bidding.

Zinc output will probably reach 370,000 tons when all production reports for the year are in, close to 40,000 tons above the previous top record of 1951. Value, however, looks like $113-million. Last year's figure was $132.9-million.

Lead production will reach perhaps 156,000 tons, not a record, but comfortably more than the 152,000 tons turned out in 1951. Estimated value is $47-million, down $9.1-million.

Anacon Lead Mines' three-year period of exemption from federal income tax as a new producer expired in May, so the management stressed production in the early months of the year. As a result, net profits were 33.2¢ per share for the first nine months compared with 27.15¢ in all of 1951. Earnings are currently on a lower level, but the company is in position to mill above-average ore to maintain profits if necessary. Current operating profits are of the order of $90,000 monthly, or about 35¢ per share annually, giving the mine a good cushion against further price declines.

Ascot Metals Corp. hopes to increase tonnage and thus compensate for revenue lost by declining lead and zinc prices. With development work not too far ahead of production requirements at the **Suffield mine**, and with **Moulton Hill mine** already operating at maximum, the company has little chance

to pick and choose grades as metal prices vary.

With mill capacity 4,000 tons daily, **Barvue Mines** doubled production last month with the largest initial capacity in Canada's history. It is expected that the 4,000-ton rate will have been reached by year's end. Grade of the ore isn't high, but production is fortified by a firm contract for 175,000 tons of concentrate at 1.7¢ (U.S.) for contained zinc, with silver and pyrite income additional. This contract will keep the mine busy for more than two years, so the company has no immediate worries over metal prices.

Buchans Mining Co. last year produced 63-million lb. of zinc, 32-million lb. of lead, and 5-million lb. of copper. A subsidiary of American Smelting & Refining Co., Buchans operates Newfoundland's only lead-zinc-copper mine, net profits from which are split equally with **Anglo-Newfoundland Development Co.** Information published by AS&R is sketchy, but the conclusion appears logical that though profits are reduced considerably, production is in no danger. The mine has been operated steadily since 1928 and survived the low-price era of the thirties.

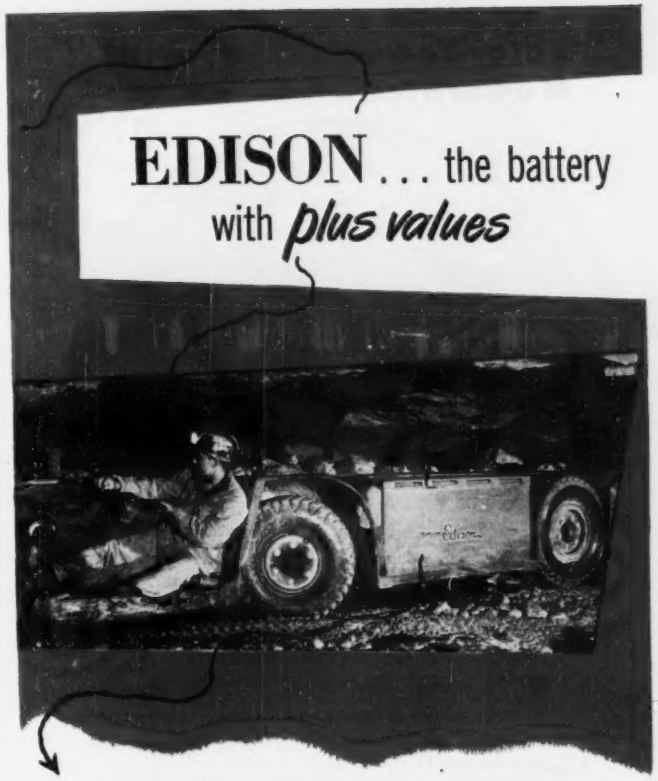
East Sullivan Mines' ore contains more copper than zinc, but the latter metal is important to the tune of some 28-million lb. per year. Current zinc quotations have obviously reduced recent profits in a substantial way. Should the trend to reduced profits continue, the company would turn to orebodies having higher copper ratio and leave the zinc for better market conditions.

Golden Manitou Mines last year produced 33-million lb. of zinc and 2.4-million lb. of lead in addition to values in silver and gold. While no recent report is available as to earnings, they will be substantially off from those of 1951.

Mindamar Metals Corp., with a four-year contract for zinc production from the British Government at a fixed (though undisclosed) price and a two-year contract for lead-copper concentrates, has little immediate concern over metal-price trends. This Dome-controlled base-metal mine, which brings Nova Scotia back into the lead-zinc production fold, started production at mid-year and is already believed to be registering good profits

Faced with heavy development costs, **New Calumet mine** omitted its expected August dividend, stating at the time that declining metal prices were the governing factor. Since that time, the management has been able to raise grade of zinc millfeed about 1%, with corresponding increases in other metals. It is unlikely that 1952 earnings will approach the 31.1¢ per share of the 1951 fiscal year, but no official word is available on which to estimate how far they will decline.

Normetal Mining Corp. net profits in the first three quarters of 1952 were 19.7¢, 16.7¢, and 10.2¢ per share. Net for the final three months may show a further decline. The drop from last year's nine-month net of 57.8¢ is due



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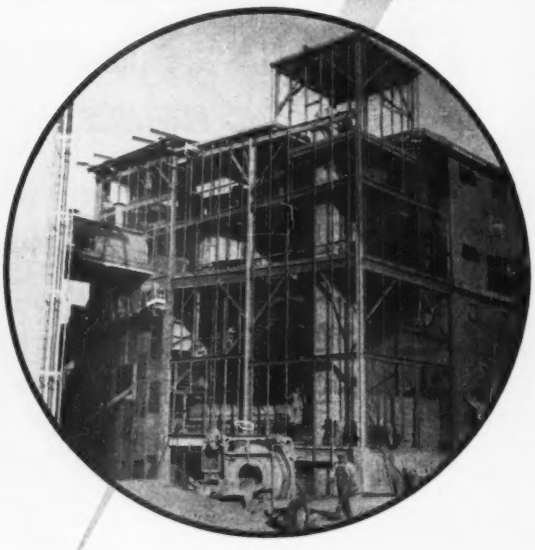

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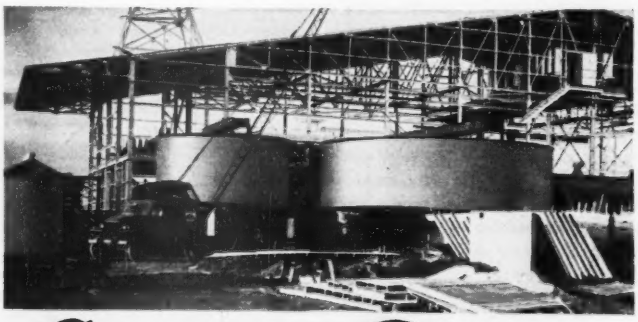

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Lead-Zinc *(Continued)*

largely to lower zinc prices but also to lower zinc output caused by the drop in grade which followed when the zinc-rich **No. 3 orebody** was mined out last year.

Quemont Mining Corp., doubtless due in large measure to the price decline, earned only $1.59 per share the first nine months of this year, compared to $1.87 in the corresponding period of 1951. That Quemont is a big copper-gold-silver producer, as well, provides diversification, however. Confidence of the management is reflected in its declaration of Quemont's third dividend, a year-end distribution of $1 per share, the same amount paid last December and again at mid-year.

Waite Amulet Mines' biggest source of income is copper, and so the firmness in that metal has softened the impact of lower zinc quotations. Waite Amulet produces no lead. While earnings are running at lower levels than those of last winter, there is little danger at this time that the company will have to reach for the red ink.

British Columbia

Lower prices have hit many British Columbia mines, stalling the opening of one new mill and cutting production of another.

However, Canada's Minister of Mines George Prudham, addressing the annual meeting of the British Columbia branch of CIMM, said that while the current price decline indicates stockpiling is slowing up, there is promise in expanded uses for the metals. He pointed, for example, to increasing quantities of lead being used in high-octane fuels.

Sil-Van Consolidated mine's new 150-ton mill near Smithers was ready to begin operation the first of November, but its directors decided against the start because of low prices. Company officials said a fair profit could be made at current prices, but they wished to conserve the three-and-a-half-year tax-free period allowed a new mine after it starts production.

Western Mines, Ltd. is cutting its production staff at Ainsworth, increasing treatment of customs ores and reducing the amount of its own ores treated. In order to build up its stock of ore reserves to justify expansion of new facilities and thus make the operation profitable, the company intends to develop steadily the **Florence and Lakeshore veins.** Some high-grade ore will be extracted from the Lakeshore vein in order to maintain steady mill operation in the meantime. The price slump and impending wage increases were given as reasons for the new policy.

Overall effect probably will be reversal of a trend which seemed earlier this year certain to establish a new record for British Columbia. Value of mineral production this year is estimated to be approximately $164-million, compared with $175,659,591 in 1951 and $152,500,000, the next high-

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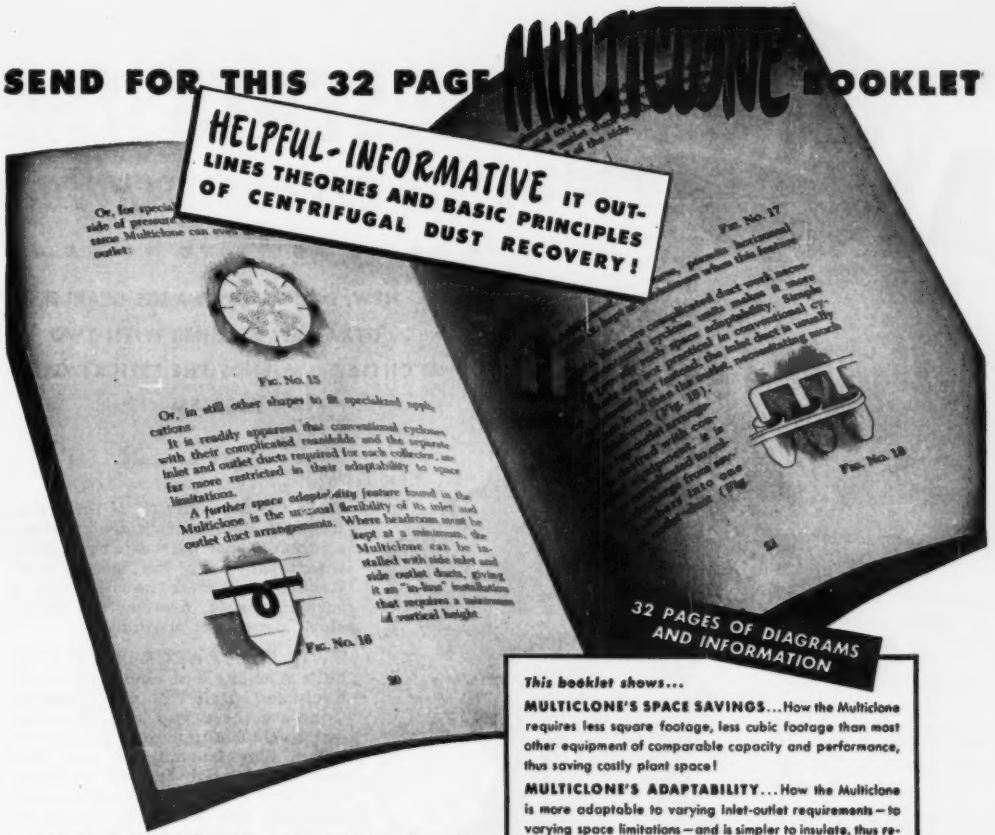
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Fig. No. 18
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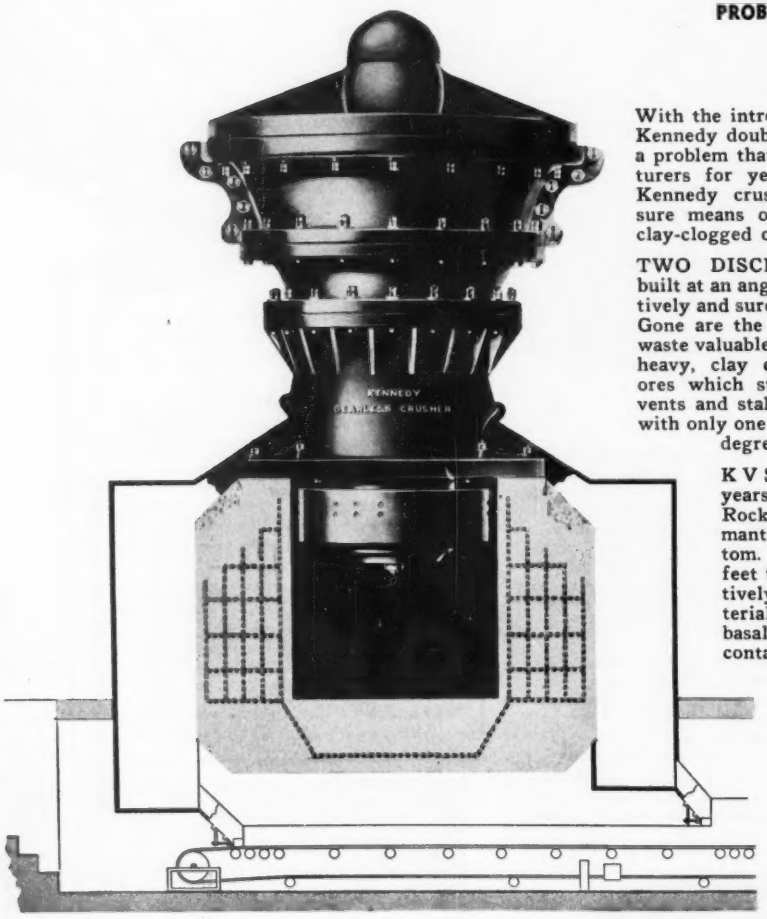

Cut away drawing of crusher showing double discharge outlets, Welland Canal feeders and continuous belt mechanism for steady flow of material.

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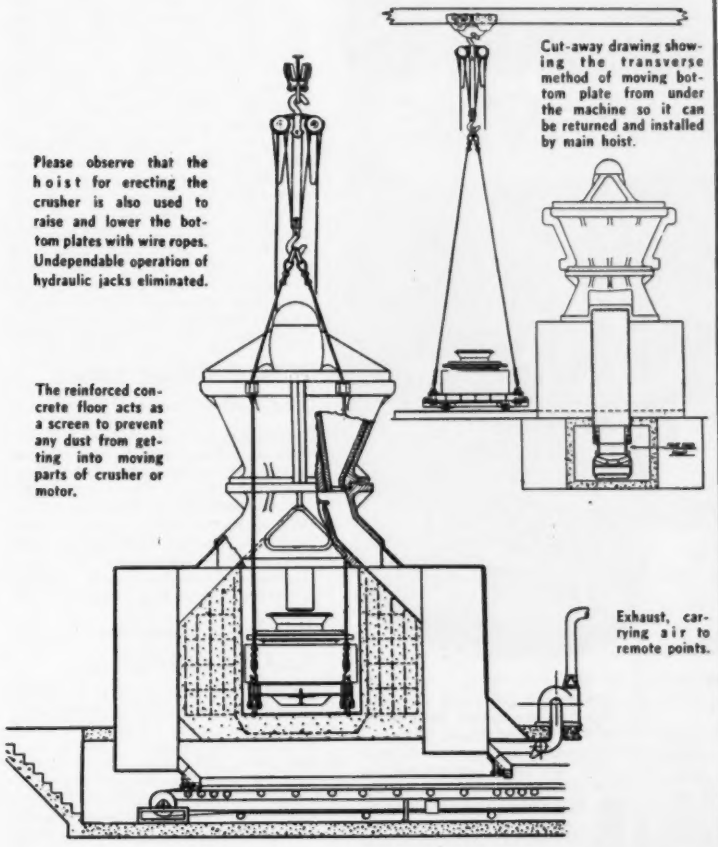
Cut-away drawing showing the transverse method of moving bottom plate from under the machine so it can be returned and installed by main hoist.
Please observe that the hoist for erecting the crusher is also used to raise and lower the bottom plates with wire ropes. Undependable operation of hydraulic jacks eliminated.
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Lead-Zinc (*Continued*)

est, in 1948. The drop is attributed to lower lead, zinc, and gold prices, the latter in turn attributable to the Canadian dollar's record-high value. Preliminary 1952 figures announced by Hartley Sargent, chief of the mineralogical branch of the Province's Department of Mines, are based on expected slight decreases in production of coal, gold, silver, and lead, and increased output of zinc and copper.

Mexico

Hardest hit are the smaller operators. Such big producers as American Smelting, Fresnillo Co., and Peñoles—which to date have been able to maintain production at former levels—are frankly pessimistic. Price declines are only one factor. High taxes, higher wages, and the 20% rail-freight-rate hike effective Nov. 15 on mining and other products are cause enough for pessimism. Increased freight rates, vigorously protested by the Mining Chamber, are expected to yield National Railways an additional 160-million pesos ($18,400,000) a year, 60-million pesos of which is earmarked for wage increases. In some quarters, hope was expressed that President-Elect Cortines, whose term was to begin Dec. 1, would provide tax relief.

$403.2-Million Asked For Gold Coast Plan

A $403.2-MILLION PROGRAM to exploit Gold Coast bauxite deposits has just been proposed by the British Government, the *N. Y. Times* said. Plans include damming the Volta for a 560,000-kw. hydroelectric plant and construction of a smelter capable of producing 120,000 long tons of aluminum a year, additional rail and highway facilities, schools, and living quarters.

Bagdad Expansion To Cost $14-Million

DMPA ANNOUNCED THAT Bagdad Copper Corp. will spend approximately $14-million during the next two years to expand the open-pit mine at Bagdad, Ariz., and install a new electrolytic refinery. The company's present annual capacity is 20-million lb. of recoverable copper contained in concentrates. Completion of the expansion program will increase the company's annual productive capacity to 35-million lb. of electrolytic copper and 12-million lb. of recoverable copper contained in precipitates. Expansion will also enable the company to produce at least 940,000 lb. of molybdenite concentrates per year.

DMPA has guaranteed the company a market for 27-million lb. of copper a year at 24½¢ per lb. f.o.b. Middle West markets and for 940,000 lb. of molybdenite yearly at 60¢ per lb. for molybdenite contained in concentrates. The agreement covers eight years terminating June 30, 1962.

Gas From Shale Oil Would Cost 14.7¢ NCA Study Indicates

SHALE OIL production of gasoline on a large scale will cost at least 3¢ per gal. more than cost of production from petroleum, L. C. Kemp, Jr., told the New York section AIME, at a recent meeting. Kemp, who is research director of The Texas Co.'s refining department, based his conclusions on findings of a comprehensive study by the National Petroleum Council.

(NPC concluded further laboratory and pilot plant study is necessary in advance of commercial operation. The prospects for commercial development would be much better if only the quality of crude shale oil were better, or known shale deposits occurred close to major consuming areas.)

Kemp said NPC's estimates indicated per-gallon cost of gasoline from one proposed minesite and plant setup would be 16.2¢ but could be reduced to 14.7¢ if similar operations were diffused through five well chosen sites. (NPC report cited price quotations of gasoline at refineries and bulk plant of about 12½¢ per gal. as prevailing at time of study.) In sharp contrast to Bureau of Mines' estimate that the fuel could be produced by coal hydrogenation for only 11¢ a gal., NPC arrived at costs of 41.4 and 43.5¢, respectively, for hypothetical single and multi-plant operations.

Calculations on cost of production by the Fischer-Tropsch process developed by the Germans in World War II had not been finished by NPC, but others had put cost at from 20 to 25¢.

(Kemp pointed out that Bureau cost estimates did not include a return on investment or income taxes of the producer. Actual cost from petroleum includes 52% income tax. He said Price Waterhouse and Co. recommended the study allow 15% for investment-after-taxes return but that NPC, wishing to portray the most optimistic picture for the process, had allowed for only 6% return and 50% income tax.)

Shale Oil Process

In obtaining oil from shale, application of 900 to 1000 deg. F. heat at about 10,000-lb. pressure breaks out oil, coating the shale residue with a coke film that provides fuel for the continuing process. Perfection of this process, said Kemp, is directed toward maximum utilization of heat available from residue and minimization of gas and coke production. One economy for which NPC made allowance in its estimates is utilization of the very large amount of extremely low-Btu (about 85 per 1000 cu. ft.) gas by-product, noncommercial except as a fuel supply at the retort. This saving in energy was given as NPC's reason for choosing location of the bulk of refining operation at the retort.

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Washington Contract

Stevens County PUD, of Colville, awarded a $25,593 contract for construction of a 5.8-mi. transmission line from the Spirit substation in northern Stevens County to the Deep Creek property of **Goldfield Consolidated Mining Co.** The line will carry 60,000 v. Completion is scheduled late in December.

N.C. Certificates

Certificates of incorporation have been granted to: **B. and R. Mica Co.**, of Burnsville, to deal in lands, mines, and mining rights with authorized capital stock of $50,000. Incorporators are D. M. Robinson, of Mars Hill, and Yates R. and Mark W. Bennett, both of Burnsville. **Carolina Solite Corp.**, of Albemarle, to deal in minerals of all kinds. The firm has authorized capital stock of 1,000 shares of no par value, of which 50 shares have been subscribed by the incorporators, W. H. Morrow, Oron J. Roberts, and Frank N. Patterson, Jr., all of Albemarle. **Lincoln Mining Co.**, of Durham, to operate a mining business. The firm has authorized capital stock of 100 shares with no par value, of which three shares have been subscribed by E. K. Powe and S. C. Harward, both of Durham, and Ann Newton, of Creedmoor.

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Beryllium Depot

GSA launched a program for the **purchase of beryllium** at the purchase depot now operated at Spruce Pine, N. C., for purchase of mica.

Silver Mountain Lead Merger Concluded

Silver Mountain Lead Mines, Inc., has successfully concluded the big property-merger deal on which it has been working for the past year or more. Some 2,500 acres of mineral ground northeast of Mullan, in the Coeur d'Alene region, has been consolidated under a stock-purchase plan. Certificates of Silver Mountain stock have been issued for the following:

Idaho Silver group, owned by Idaho Silver Corp., 771,000 shares.

O'Brien group, owned by Vincent Newbury and the late Mike Kinsella, 632,000 shares.

Little Jim (formerly Lucky Boy) group, owned by Little Jim Mining Co., wholly-owned subsidiary of Bunker Hill and Sullivan Mining and Concentrating Co., 781,000 shares.

Snowstorm group, owned by Snowstorm Mining Co., 460,000 shares.

Coughlin group, owned by Wallace businessmen, 172,000 shares.

Mineral rights to the Worthington ranch, 95% owned by Sullivan Mining Co., 230,000 shares.

The Giachino property, 10,000 shares.

One company, Vindicator Silver-Lead Mining Co., rejected Silver Mountain's offer of 425,000 shares for its three-claim property.

The consolidated property will be developed by **Sullivan Mining Co.**, which is jointly owned by the Bunker Hill and Hecla Mining firms, under a profit-sharing agreement. Surface exploration and geological study have been in progress since last spring.

Idaho Silver Corp. has distributed its Silver Mountain stock to its shareholders and will be dissolved.

Kennecott, Union Fail to Settle

Despite a continuous 20-hour negotiation session in Salt Lake City, officials of **Kennecott Copper Corp.** and International Union of Mine, Mill and Smelter Workers were unable to reach a contract settlement.

Employees of Kennecott's Utah Division have been working on a day-to-day basis since contracts with Mine, Mill expired June 30.

In latest efforts to reach agreement, S. Lyle Johnson, Salt Lake City negotiation-conciliation commissioner, was joined by Federal Mediators Arthur Viat, of San Francisco, and Earl Ruddy, of Los Angeles.

After the fatiguing session, there were indications the two sides were as far apart as ever. However, it was believed a new effort would be made now that the election is over.

Bruhi Developing Rich Nevada Ore

Development of one of the richest silver-gold orebodies found in the district for some time is proceeding at the Mohawk mine, operated by **Bruhi Enterprises.** The property lies in the Silver Peak district. Mervin J. Gallagher, Nevada inspector of mines, reports that the vein has been exposed for several hundred ft. by drifts. The Mohawk flotation mill, formerly the Black Mammoth, is now treating 50 tons of drum ore from the Nivloc mine daily and is scheduled to operate at full capacity of 150 tons daily in the near future with ore from the Mohawk and other nearby mines.

Oregon Chromite Activity Steps Up

Chromite has been exposed in **northeasterly extension of serpentine** in Douglas County, where O. W. Stuemges, Myrtle Creek, has found small stringer chromite and high-grade ore. The area is 5 mi. up Little River from Glide. The chromite occurs as float on the steep hillside and in place near the ridge top about 700 ft. above a road approaching the area.

Near John Day, **new chromite discoveries** were found on the Haggard-New property in Grant County. The property is owned by William Gardner and Ray Summers. The new lens is believed to be shipping-grade chrome ore. Another large lens of chrome ore was found at Dry Camp mine, owned by H. R. Elliott. It is expected the ore will be milled at the Tri-State concentrator, just east of John Day. The Dry Camp mine was formerly leased to Bert Hayes, who milled some of the ore.

Walt Freeman and La Vern Twombly, Cave Junction, are setting up a small **chrome concentrating mill** below Sourdough Flat and plan to handle ore from the Wonder group. Installations will consist of a hammermill, a Gibson rodmill, and one table. Sourdough Flat is about 2 mi. south of Pearsoll Peak on the Curry-Josephine-Counties border.

Ben Baker has begun **production of chromite concentrates at a** mill installed at Sourdough mine on Baldface Creek. Owners of the mill and mine are F. I. Bristol, Ben Baker, and T. T. Leanard. Equipment includes an 8 x 16 jaw crusher, a ball mill and screen, and two concentrating tables. Capacity is 1½ tons an hour.

Magnesium Shipments

Daily shipments of six to eight railroad cars of quartz silica, averaging about 60 tons, are going to the government-owned magnesium plant north of Spokane, operated by **Pacific Northwest Alloys Co.,** from the property of Katherine Grover about 4 mi. east of Newport, Wash.

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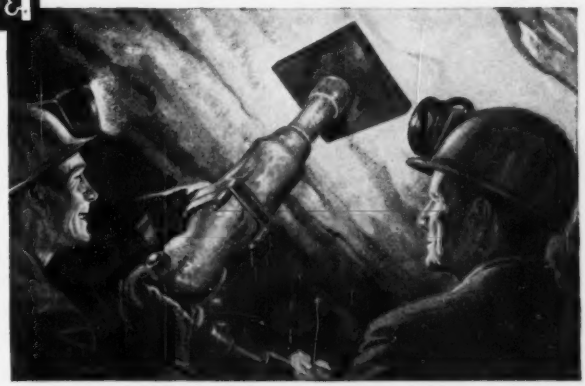
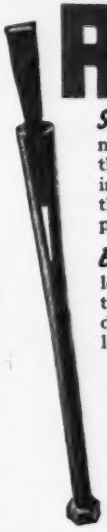


ROCK BOLTS



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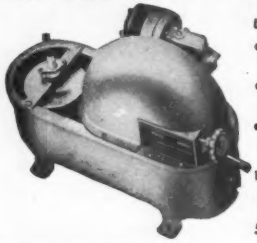

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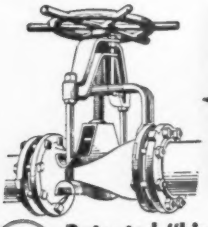

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More Idaho Silver For Sunshine Mining

Sunshine Mining Co., the nation's largest silver producer, has discovered a deep-seated silver vein in its Coeur d'Alene property between Wallace and Kellogg. It is about 500 ft. north of the main Sunshine vein in a northeast exploration crosscut being driven from the 3,700-ft. level of No. 4 shaft. The vein is a strong siderite structure containing tetrahedrite (silver ore) in commercial amounts. Drift work shows the structure to be narrowing with improved ore mineralization to the east of the crosscut. The area is relatively unexplored, but one diamond drill which penetrated the area on the 3,100 level did not show the structure. Exploration objective of the crosscut in which the discovery was made is the large unexplored segment of the Silver Syndicate vein between stoping areas of the Rambo.

Reopen Copper King

Chewelah Copper Co. is reopening Copper King mine. The lower tunnel is being cleared out, and a dragline opened the first 100 ft. of the 1,000-ft. adit. Installation of 75 ft. of new timbering has been done outside the tunnel mouth, according to W. B. Moorhead, foreman. In order to reach the solid rock, it is expected that 70 additional ft. of caved tunnel must be opened.

The company has also rehabilitated the 4,220-ft. main adit of nearby United Copper mine. The 400 ft. level has been opened for 250 ft.

Nevada Tungsten

Diamond drilling is under way at **the Stormy Day tungsten property** in northwestern Pershing County. Robert E. Taafe, of Reno, and John Thrasher, of Gerlach, have spent about $65,000 in development work. The property comprises 30 claims developed by several tunnels and considerable underground workings. There is said to be 19,000 ft. of contact between granite and lime, and recently a 2½-ft. vein of molybdenite was found in the footwall. The property is reported to have shipped $100,000 worth of ore in previous operations.

IN THE U. S.

ARIZONA

★**Atlas Mining Co.**, Aguila, is shipping manganese ore from its Black Nugget No. 1 mine in Maracopa County in accordance with terms of a contract just signed by **R. L. Wilson Associates, Detroit, Mich., Atlas' parent, and U. S. Manganese Corp.** for 20,000 tons of ore. The manganese will be used in steel production.

Standard units used separately or in combination

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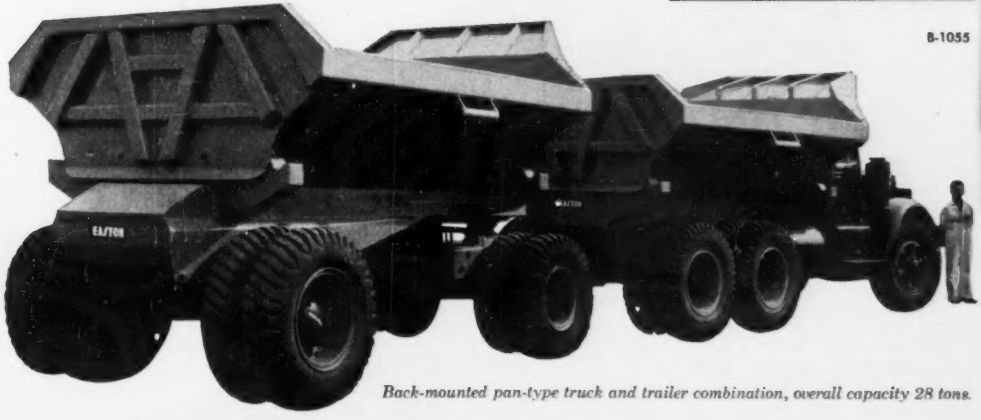
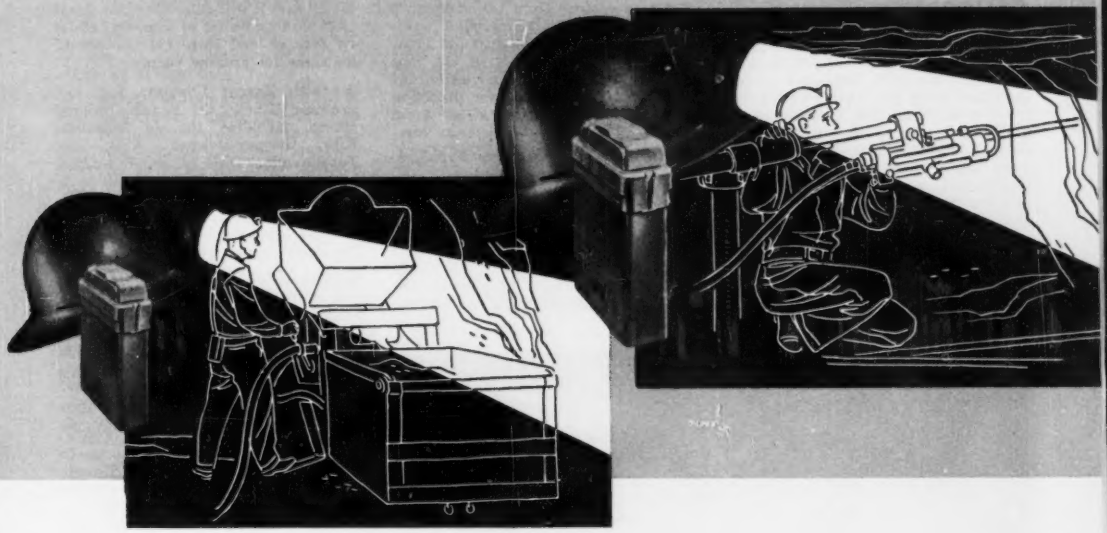


Back-mounted pan-type truck and trailer combination, overall capacity 28 tons.

THE LIGHT



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CALIFORNIA

★**Mountain Copper Co.** at Iron Mountain is currently producing 1,300 tons of pyrites a month, principal mining operation being carried on in the Richmond area. Production is obtained by underhand stoping and Hornet-type coyote blast-hole practice. Main aerial tram has been extended to simplify transportation of crushed ore to the railroad station. Workers now number 120.

★About 1,000 tons of tungsten ore is being treated daily by the concentrator at **U. S. Vanadium's** property at Pine Creek, Inyo County, about 650 tons coming from the company's Pine Creek mine. Underground development is lagging because of labor shortages. Construction of 29 new houses at the Rovana settlement at the creek's mouth and new diversion dikes to prevent snow slides from damaging concentrators is near completion.

COLORADO

★An historic test case to determine the extent of grazing rights on federal land has been filed in the U. S. District Court. The U. S. District Attorney, who termed it the "first of its kind," said it will determine this question: **Can an owner of a mining claim on federal land lease the surface of his claim for grazing purposes?**

★**Atomic Energy Uranium, Inc.**, has acquired title to the Pewabic mining claims, including the Jo Reynolds, Kirk, German-Belcher, Alps, and Topeka mines (all of which contain uranium) in Russell mining district, Gilpin County. The company was planning to begin operations immediately and has a broad plan to operate both the Pewabic and Iron mines.

★Jeopardy of the rights of uranium miners to develop deposits in **areas embraced by federal oil and gas leases** may be resolved by interpretation of the authority conferred on the Atomic Energy Commission by the Atomic Energy Act of 1946, Frank H. McPherson, manager, Colorado Raw Materials Office, said recently at Grand Junction.

★Discovery of a large vein in Illinois gulch near Breckenridge has been made **on the Pittsburgh placer** by Webb and Galmon, both of Breckenridge. Extensive sampling shows the ore to run 68.2% lead, 4% zinc, 22 oz. silver, and .04 oz. gold to the ton. Net value will be about $160 a ton. Plans call for further development by dragline stripping and sinking on the vein.

GEORGIA

★Controlling interest in **United Clay Mines**, which operates kaolin plants in Washington County, and in Florida, South Carolina, and Maryland, has been purchased by Mayor W. J. Smith, of Sandersville, and associates.

The company, organized in 1905, has capitalization of $1-million.

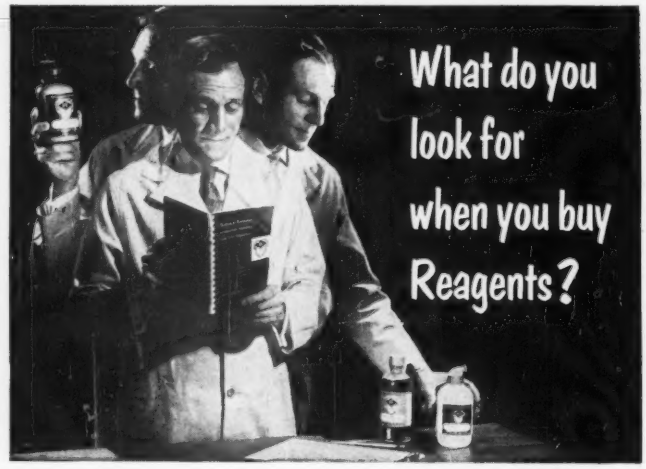
Stock of the late George C. Crossley has been sold to 30 employees in accordance with Crossley's will. No immediate change in company personnel is contemplated, said Smith, who has been in charge of the plant for 15 years.

IDAHO

★**Merger of Polaris Mining Co.** and its **subsidiary, Silver Summit Mining Co.**, is now largely completed.

First new exploration to be started by the merged firms is a west drift on the main Silver Summit vein, a strong persistent siderite structure which lies about 950 ft. south of the No. 3 vein. The drift is being run from the south crosscut on the 3,000-ft. shaft level. It is in the hangingwall to eliminate need for timbering. Crosscuts and diamond-drill holes are run at intervals from the drift.

Extension of the west drift on the No. 3 vein toward the New Purim area is continuing steadily. Some encouraging silver-copper mineralization has been encountered. This proj-



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SETTING THE PACE IN CHEMICAL PURITY SINCE 1882

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ect is being carried on under a development and profit-sharing agreement with Silver Dollar Mining Co., Lincoln Mining Co., and Hayden Hill Consolidated Mining Co.

★A mining exploration in the Clark Fork area, interrupted 31 years ago by a court order resulting from litigation over property rights, has been resumed by **Howe Mountain Mines**, a new firm headed by Compton I. White, former Idaho congressman.

Exploration was started by Clarinda Copper Mines under the direction of White's father. It consisted of a long lower tunnel to gain depth on rich copper ore which had been opened in upper workings. After it had been driven 2,100 ft., Copper Giant Mining Co., owner of adjoining property, filed suit for trespass stating that the tunnel had entered its property at 1,700 ft. The court awarded Copper Giant a judgment for $3,000 and ordered Clarinda Copper to put a 3-ft. cement bulkhead in the tunnel at the property line.

Through the years White acquired all the property of both firms, as well as some other adjoining ground. DMEA will lend White's firms $57,310 to cover half the cost of exploration. A 500-ft. extension of the old lower tunnel is expected to intersect downward projection of both the Clarinda and Copper Giant veins.

★**Hypotheek Mining and Milling Co.** has announced plans to mine its East Hypotheek workings while the $70,000 DMEA-approved exploration project is in progress. A short ore shoot about 300 ft. from the portal will be mined both upward and downward.

MICHIGAN

★**The M. A. Hanna Co. central laboratory** for the Iron River district has been moved from the Rogers mine building to the former Homer school in Mineral Hills without interruption of the working schedule. The old school has been remodeled into a modern building with two complete laboratory units. W. A. Markert, chief chemist, supervised the transfer.

★At **Hanna Iron Ore Co.'s** Cannon mine near Stambaugh, progress is being made both on surface and underground. The company is sinking the 15½-x-20-ft. concrete-lined shaft from ledge at 143 ft. to the objective, 950 ft. below surface. The mine buildings, all of which will be connected by covered tunnels, are scheduled to be completed in about one year. Two 12-ft.-drum (with 7-ft., 6-in. face) hoists are to be installed. The ore hoist will have two 1,000-hp. dc motors and is designed to lift 12 gross tons. The man hoist will have one 1,000 hp. dc motor. Both will have winding capacity of 3,300 ft. of 1⅞-in.-diameter rope. Initial distance is 1,100 ft., with an ultimate of 3,000 ft.

★Michigan College of Mining and Technology has received a **Frederick Gardner Cottrell** grant to conduct research in the field of **isotopic exchange rates of selenium**. Dr. Royal F. Makens, professor of chemistry, will direct the project.

MINNESOTA

★**Skubic Brothers of Virginia** are installing a new Wilmot-Daniels Heavy Density concentrating plant at the Virginia mine, leased from Snyder Mining Co. The plant, designed by the Abe W. Mathews Engineering Co., includes three crushers and Remer jigs.

★All **M. A. Hanna Co. mines** on the Mesabi and Cuyuna Ranges are active. New shops of the Enterprise at Virginia have been completed and much of the equipment installed. A 6-cu.-yd. shovel has been stripping 20 shifts per week, and a steel stripping bridge is being built over Highway 53.

At the Buckeye, on the western Mesabi, ore and stripping loading have been carried on 20 shifts per week.

At the Mesabi Chief, the washing plant has been operating two shifts a day, seven days a week, with stripping 21 shifts per week.

The South Agnew has received two new 29-T churn drills. Wash and direct-shipping ore have been loaded 20 shifts weekly.

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Large yardage handled at minimum cost per yard is the record of Sauerman Scraper and Cableway Machines on thousands of jobs of strip mining, pit excavation, reclaiming tailing, cleaning out ponds, stockpiling fine ores, and similar work that requires moving materials distances up to 1,000 ft. or more.

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The Story Behind the Picture

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This mining company also operates Sauerman Scrapers at other locations for various dig-and-haul jobs.

●

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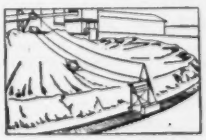
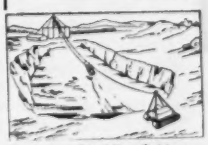
Sauerman Scraper Excavator


Sauerman Scraper Stockpiler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Minnesota (*Continued*)

The Weggum shop addition has been completed. It will house the electrical section.

The Morton 1150B dragline has been operating on a 21-shift basis, and the new hoist house for the skipway screening and washing plant is under construction.

Most of the company's Cuyuna Range mines, including the South Alstead, Feigh, Mallen, Maroco, Section 6, and Snowshoe mines have been working 21 shifts per week.

★**Interlake Iron Corp.** directors have voted to purchase Mather Iron Co.'s 30% interest in Dalton Ore Co., which will give Interlake sole ownership of Dalton, its chief source of iron ore.

MONTANA

★**Mining Association of Montana** expects to hold its 10th biennial legislative meeting in Helena about the middle of January, 1953.

★Jess Larson, DMPA administrator, announced a government survey will be made of **black manganese oxide ores** in the Butte, Philipsburg, and other western Montana areas to determine whether a purchasing depot is justified. Stations now are established at Butte and Philipsburg for purchase of manganese carbonate ores.

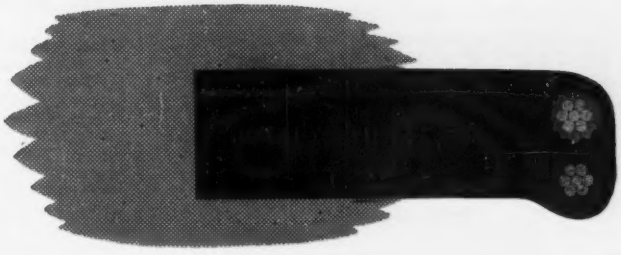
★C. W. Thornton, Troy, at a bankrupt sale took over all assets of **Morning Glory Mining Co.**, consisting of six patented and 26 unpatented claims in the Yakt mining district. The property, fully equipped for mining, has a 100-ton flotation plant. Thornton is organizing **Clipper-Bullion Mining Co.** to resume operations.

★A potentially large deposit of chrysotile asbestos is being developed about 10 mi. west of the west entrance to Yellowstone National Park by **Madisonian Mining and Milling Co.** About $50,000 has been spent on the project to date. Thirty men were employed this summer on the 54-claim property, located at an elevation of 7200 ft. C. A. Lester, president of the Madisonian firm, is also president of Interstate Products, which operates an open-pit amphibole asbestos mine in Gallatin County, said to be the state's only asbestos producer.

NEVADA

★The Sunnyside mill 20 mi. east of Austin is now being operated by **Sunnyside Milling Co.** under management of F. D. Shuck, processing tungsten ore from the Sunnyside Co.'s nearby T-Bone mine. The operators report that 86% recovery was made on the ore at the outset and that improvements have increased efficiency considerably since then. Concentrates are

REPEAT ORDERS CONFIRM POPULARITY OF TIREX SHUTTLE CAR CABLE



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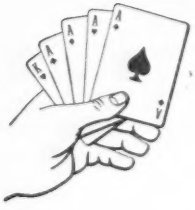

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Nevada (*Continued*)

being sold at Bishop, Calif. Several mining properties in the area that have been withholding production until the mill was completed were expected to open operations soon. Their ore will be treated at the mill on a custom basis.

★**Combined Metals Reduction Co.** has been installing a tungsten concentrator at its Caselton plant in Pioche that will increase capacity from 1100 to 1900 tons of ore daily. The new units will include milling facilities for production of iron and manganese. The company has also invested a large amount of money in a new manganese concentrator expected to make manganese one of Combined Metals' principal products. Lead, zinc, and other metals will also be recovered from the Caselton and Henderson plants. The Caselton mill will process ores from the company's mines in the Comet-Pioche district, which will have a high output of lead and zinc, as well as silver.

NEW MEXICO

★**New Mexico mines'** production record was $99,648,584 in the year ending June 30, a gain of 11% over the previous year. State Mine Inspector John A. Garcia reported an excellent safety record—only five fatalities for the year, one for each 3-million man-hours worked in the 396,000 man-shifts worked.

★Uranium mining activity continues to increase in northwestern New Mexico. **Anaconda Copper Mining Co.** is well along in construction of a processing mill at **Bluewater**, and is also building 28 dwellings. There is some stockpiling, but **Santa Fe Ry.** and others are doing exploration work and marking time until spring. The mill is expected to be ready for operation by the end of June.

★**Shattuck-Denn Mining Co.** has leased its Zuni fluorspar mines to Joe Griego, former foreman on the job. Griego will produce 100 tons a month of selective fluorspar ore.

★**The Navajo Indian Tribe**, which has so far drawn $600,000 in leasing fees and royalties from 450 uranium-claim activities on reservation lands, is preparing to go into mining as a tribal enterprise.

★**Zuni Milling Co.** is processing fluorspar from Mexico at its mill at Los Luras, near Albuquerque, and at its Deming mill.

★**Anaconda Copper Mining Co.** has completed exploration work on the Laguna Indian reservation and is mining and stockpiling uranium ores there. The company is also doing exploration work in the La Ventana district south of Cuba.

★New Mexico's potash output climbed

by a million tons during the past year as **Duval Sulphur & Potash Co.**, fourth in the Carlsbad district, went into production. Still further increase was expected to result when **Southwest Potash Co.** production figures begin coming in. State Mine Inspector John A. Garcia predicted total tonnage will top 10-million tons next year. Total was 7-million this year.

Freeport Sulphur Co. has blocked off a new potash deposit running from Eddy County into Lea. Reports are that **International Minerals & Chemical Corp.** may extend its mining operations into that area, too.

★**Production of pumice fell** off a little as **perlite chalked up increased tonnages.** In the Albuquerque area several large lightweight block makers are now using red scoria instead of pumice. Pumice production was 274,000 tons; perlite, 68,000 tons.

★In spite of recent curtailments, 50,000 tons of **zinc** were produced in the past year, valued at $13,270,914.

Copper tonnage continued to lead the metals in New Mexico last period with an output of 73,974 refined tons valued at $35,767,417.

Lead came in third with 13,205 tons worth $4,707,499, nearly doubling the previous year's output.

Schundler Perlite Co., which started mining at No Agua, Taos, in February, will turn out an estimated 40,000 to 50,000 tons this year.

NORTH CAROLINA

★**Mining and Milling Company of America**, with headquarters in New York City, is considering mining and processing deposits of asbestos in the Spruce Pine area.

Walter Rukeyser, company engineer, made a study of the deposits some time ago, and the company is reported to have acquired mining rights and made arrangements with United Feldspar and Minerals Corp. to use one of its buildings at Minpro, near Spruce Pine, as a pilot plant.

Recovery methods will be tested when pilot plant machinery is installed.

★Carolina Mineral Co. plants at Spruce Pine and Kona, and plants operated as Newdale Mica Co. at Kona and Newdale are included in a transaction by which **Consolidated Feldspar Corp.** was to have sold assets of 11 feldspar and mica plants to **International Minerals and Chemical Corp.**, effective Nov. 28.

OREGON

★**New discovery of chromite** in Curry County by Fred Gardner, Harbor, in deposits consisting of stringers of high-grade chromite in sheared and serpentine saxonite and dunite has aroused interest of mining companies in the coastal range stretching across the California-Oregon border.

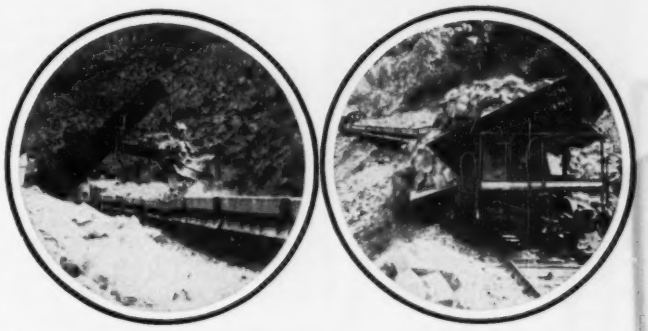
Gardner has filed three claims and reports chromite was found in place last July 4 in one claim named Fourth-of-July. The property is 1½ mi. north of Vulcan Peak, about 35 mi. northeast of Brookings, just beyond drainage of Boulder and Box Canyon Creeks. A U. S. Forest Service road reaches to within 2 mi. of the workings, and Gardner intends to have the route extended to the saddle just west of Vulcan Peak.

The ore is close to a system of siliceous dikes, apparently rhodingitis. Stringers as much as 4 ft. in width are exposed in place on the surface, but most are from a few inches to about 1 ft. wide.

Development consists of several elongated open cuts which expose the ore in place. Less than 10 tons of ore had been mined by late fall, but greater amounts were seen in place. The deposit was described as promising.

★The concentrating plant of **G.M.C. Mining and Milling Co.**, west of Eagle Point, has been purchased by **Laughlin Engineering Co.**, Los Angeles. Lester L. Sibley, manager, reported production was scheduled for about 600 tons of stockpiled chromite from the Sordy mine in the Briggs Creek area near Galice. Chromite is being shipped from a mine about 12 mi. west of Mount Shasta, Calif. The Tyrrell manganese mine in the Lake Creek district, east of Eagle Point, has

Yes, you're seeing DOUBLE



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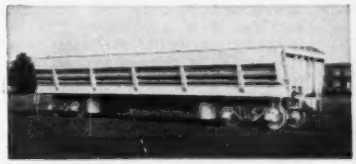

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Oregon (*Continued*)

been leased. The firm reports initial production will be chromite concentrates, but later manganese ore will be milled as well.

WASHINGTON

★**Centennial of mining** in Washington is being celebrated this year. In 1852 the industry began in a coal property on Bellingham Bay. In a biennial report, Sheldon L. Glover, supervisor of the State Division of Mines and Geology, stated that annual output at the end of 1950 was $49-million and that by the end of 1952 total value of wealth produced will be almost $1.2-billion. Production of mineral and mineral aggregates in the decade 1941-50 was valued at nearly $380-million. This included $85,858,053 in metals. The average annual value of the five chief minerals—gold, silver, copper, lead, and zinc—was more than $8.5-million, or 22.6% of the total. In 1950 metal production was over $12.5-million, breaking all previous records. Final figures for 1951 are expected to exceed $14-million. A recent survey showed 82 metallic mines active, compared with 98 in 1951. Mr. Glover attributed the decrease to various prospects failing to reach expected production or near-production status.

★**Hanford atomic works** is scheduled for a $138-million expansion program. **Henry J. Kaiser Co.**, of Oakland, Calif., reported its phase of the program will total about $110-million. Peak employment is expected to be reached by the middle of 1954.

★**The expected 10% cut-back in power deliveries** to major consumers, expected to affect 132 plants, was to become effective Nov. 17 and remain in effect until the end of April unless water conditions improve before that time.

Consumers using more than 8,000 kw. a week are limited to 90% of the amount used during the same period last year.

★A recent statement from Washington State College deals with **zinc as a fertilizer.** Columbia Basin and Yakima Valley are among the "most zinc-deficient areas in the world," according to Frank Viets, a soil scientist at the irrigation experimental station at Prosser. Three years of work on methods of applying zinc to crops has been spent by Viets and other scientists.

IN ALASKA

★**U. S. Tin Corp.** expected to work through the winter with a 70-man crew at its **Lost River** mine on Seward Peninsula. Ken Kadow, president, said mining and milling was at about half capacity in September and October due to delays caused by the shipping strike and cancellation of Alaska Steamship Co.'s August ship sailing, but full production was expected before the end of the year. About 1,000 ft. of tunnel and a 400-ft. shaft from which to draw the winter water supply are a part of the scheme. A recreational hall 20 x 80 ft. and 24 new homes were being completed.

★Ernest C. Smith, mine foreman, told recently how **U. S. Tin Co.** mines tin and tungsten in a 12-to-15-ft.-wide, clay-like vein: Tunneling is done in the footwall limestone, not in the soft material, and raises are run from the main haulage tunnel. Laterals are then run from raises to vein. Holes are drilled fanlike into the vein. Eighteen 40-ft.-long holes are used for each round of blasting. Broken ore drops down the vein to chambers from which it is bulldozed into chutes going into the haulage tunnel. A 370-ft. shaft reaches the underground workings. In spite of temperature ranging around 20 deg. below zero during three winter months, mining is continued.

★U. S. Geological Survey recently reported there is good chance of **a commercial deposit of uranium** in the headwater region of Peace River. The agency made a one-week survey for AEC this summer.

IN CANADA

LABRADOR

★**Dr. Joseph A. Bancroft,** one of the geologists who discovered the rich 400-million-ton copper orebody in Northern Rhodesia, will be sent here by **Anglo-American Corp.** to investigate Labrador's mineral resources. The company recently joined a group of financial and mining concerns undertaking the survey.

Dr. Bancroft led a geological team that surveyed most of Southern Rhodesia and proved extension of the Witwatersrand gold-bearing reefs into the Klerksdorp area.

MANITOBA

★**Northern Tungsten Ltd.** plans development of its tungsten prospect located at Squall Lake Creek in the Herb Lake area. Scheelite occurs along a north-south shear zone. An adit has been driven 105 ft. and some 400 ft. of drifting done. The company estimates 14,400 lb. of tungsten concentrates on hand averaging 20-40% tungsten trioxide.

★**International Nickel Co.** is continuing an intensive diamond-drilling program on claims in the Grassy River and Mystery Lake area. At present some 14 drills are in operation exploring nickel mineralization found in areas of basic rock.

NEW BRUNSWICK

★**Island Mountain Mine Co., Ltd.,** one of five gold mines in British Columbia that has managed to stay alive through the current depression in the industry, is preparing to shut down. Directors have decided to halt exploration work at the mine at Wells, in the Cariboo, and to mine remaining ore reserves as long as this can be done at a profit, probably about nine months. Zone drilling has revealed more than 1-million tons of milling-grade fluorite material assaying 20% fluorite and 20% celestite, with uranium and rare earth elements, including cerium, ytrium and lanthanum.

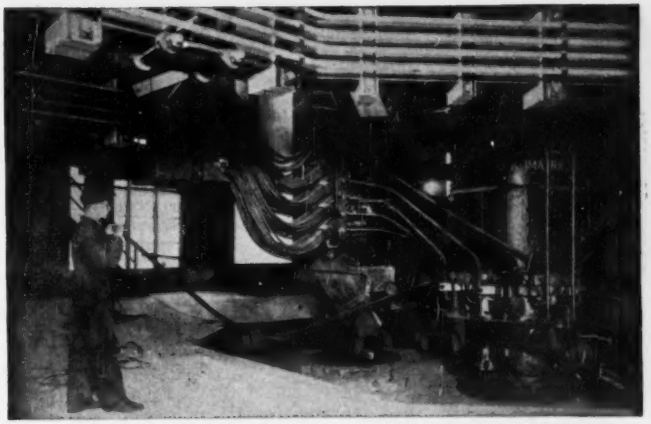
★**Tungsten of British Columbia, Ltd.,** originally formed to develop a 22-claim group of tungsten-bearing claims at Devil's Elbow, on the Stikine River, has taken in several other holdings, including the Belle Grotto copper-gold property near Usk, from which it is planning early shipments. Returns from shipments of high-grade copper-gold-silver and lead-zinc ores are expected to be sufficient to cover cost of blocking out tonnage necessary to justify building a mill. The company has also acquired an option to buy the Stuart Lake Snowbird antimony property, which consists of 13 claims.

★Protests against export of British Columbian iron ore have been countered by J. Cowan Adam, president of **Quatsino Copper-Gold Mines, Ltd.,** which has a contract for sale of its ore to Japan to supply that country's steel mills.

Quatsino, he told the annual meeting, had offered priority to Western Canada Steel Co., Vancouver, which is reported planning a steel plant, but had received no reply to its letter. The company had not been approached by any potential local user of Quatsino ore, he said, although many outsiders, including one from Germany, had made approaches. He stated that Quatsino would be willing to help any local steel plant but could not open its property on a small scale. Quatsino proven ore is estimated at 1,045,137 tons and indicated and inferred ore at 1,500,000 tons. The company plans initial production of 75,000 tons of ore monthly.

★Canadian Government made close to $2-million net profit on its plunge into the tungsten-mining business in British Columbia, or about $100,000 for each month it owned the Emerald Tungsten mine, near Salmo, which it sold back to **Canadian Exploration Co.** The government made a net profit of $1,051,000 on operation and gained $872,000 on the re-sale of the property, purchasing for $328,000 and selling for $1,200,000.

★**Rexpar Uranium and Metals Mining Co.** is boosting uranium hopes for British Columbia with development of its property at Birch Island, near Kamloops.



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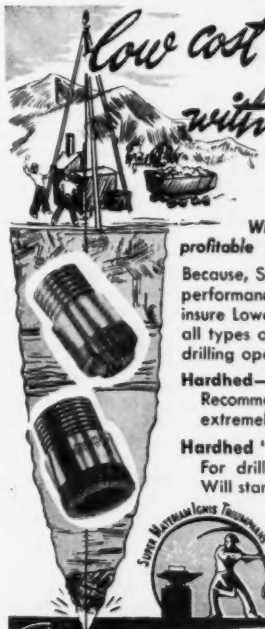

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ONTARIO

★Two of the most significant drill holes reported in Canada in many years have been logged by **Kerr-Addison Gold Mines**, the country's top gold producer. Both show excellent ore across impressive widths, and both are deep, the upper one showing ore at a point 1,000 ft. below anything ever encountered previously in the mine.

Both are flat holes put out ahead of crosscutting on deep levels. (Eight new crosscuts are being established following completion of shaft deepening last year.) On the 3,550-ft. level, an intersection of 43 ft. assayed 0.855 oz. gold per ton, a second one returning 0.38 oz. across 17 ft. On the 3,700-ft. level, a hole showed a true width of 40 ft. averaging 1.17 oz. gold per ton.

The holes add appreciably to Kerr-Addison's potential. Above the 2,500-ft. horizon, it is estimated that enough ore remains in place to keep the mill going at its 4,400-ton rate for at least a dozen years. The deep intersections, while still only drill results and separated from proven ore by 1,000 ft. of depth, suggest that at least another 10 years of milling life can be added to estimates.

★**Chesterville Mines**, latest of Canada's gold-mining casualties, plans to use close to $1-million in net current assets, after liquidation, to seek new mining activities.

QUEBEC

★Biggest initial milling capacity in Canada's history features the operation of **Barvue Mines**, which recently started production in Barraute Twp. First ore went through the crushers at the rate of 1,000 tons per day, and by the end of the year the plant is expected to be handling 4,000 tons daily.

Barvue is one of few zinc producers with no immediate concern over the metal's price (see page 147) having gone into production with a firm contract for 175,000 tons of concentrates at 17.5¢ (U. S.) per lb. of contained zinc. Additional revenue accrues from the ore's silver content and pyrites.

★Daily milling rate of **Bevcourt Gold Mines** is being raised from 300 to 600 tons with addition of extra grinding equipment.

★**Fort Chimo Mines**, controlled by **Ventures, Ltd.**, through **Frobisher, Ltd.**, will step up exploration of a long narrow concession of 500 sq. mi. between those of Norancon and Fenimore. Work this year turned up what may be an important deposit of direct-shipping-grade manganiferous hematite. Little is known about it yet, but bulk sampling on the surface suggests an iron-manganese content of about 50%.

★Several finds of copper, both native and combined, have been made this year by **Frobisher, Ltd.**, on its 3,860-sq.-mi. concession west of Goose Bay. Information obtained so far is sketchy, but—along with the known favorable nature of the geology—sufficiently encouraging to warrant an increased tempo of exploration next year.

★**Gaspe Copper Mines** is looking bigger than ever. Two deep drill holes put down this fall have indicated what appears to be a fourth ore zone. Assays were lean, but possibilities to be further explored are encouraging.

SASKATCHEWAN

★**Beta Gamma Mines, Ltd.**, has diamond-drilled 11 holes on its Hammond Lake uranium property in the Beaverlodge area. Current drilling is focused in the westerly extension of the "A" shear. Holes are being spaced at 100-ft. intervals.

YUKON

★**Yukon Consolidated Gold Corp.**, which optioned Gold Bottom Creek properties, is doing exploration work to determine copper content and extent of orebodies. A 50-year-old shaft has been emptied and timbered and an old drift opened. Further drifting is planned.

★Ninety claims near Kluane Lake have been optioned to **Hudson Bay Mining & Smelting Co., Ltd.**, and some exploration work done. The best showing is reported to be 48 ft. wide. Assays show 3.2% nickel, 2.2% copper, 0.14% cobalt, and some platinum and other precious metals.

IN LATIN AMERICA

CHILE

★Well-informed circles were predicting President Ibañez' new government would satisfy the miners' 30-year demand for a ministry of mines and industries giving them a voice in the cabinet. Mining brings Chile about 75% of its foreign exchange and much of its revenue.

★**Harry Guggenheim** was given the Chilean order of merit in recognition of the part the Guggenheim family played in development of copper porphyries and a new process for recovery of sodium nitrate from low-grade ores, which literally saved the nitrate industry when it was menaced by competition of synthetic nitrogen fertilizers. Presentation was made by Chilean Ambassador to the U. S. Nieto del Rio at a luncheon in New York.

★Observers were saying "slow work" on the part of some key workers at both mine and leaching plant was re-

sponsible for the decline in late summer and early fall from 19,000 to 13,000 tons a month in copper output.

★General Manager C. Brinckerhoff said **Chile Exploration Co.'s** new smelter at Chuquicamata would be fired in by the time this issue goes to press. Some sections of the Chuquicamata flotation concentrator were already in operation at the time he issued his statement.

GUATEMALA

★**Hugo Recinos Avila** has applied for a franchise for a 50-year concession and rights to mine a Recinos family-owned lead-silver deposit near San Sebastian in the Huehuetenango area. All capitalization will be Guatemalan.

MEXICO

★Import-Export Bank reportedly has put up $3.664-million to help **Panamerican Sulphur Co.** finance its projected $6.7-million sulphur plant in the Jaltipan area south of Vera Cruz. Construction is scheduled to begin in February and be completed by August, 1954. It was said the company, through its subsidiary, Gulf Sulphur Company de Mexico, S. A., had already spent more than $1-million exploring the area.

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PERU

★**Cerro de Pasco Corp.** recently concluded a diamond-drilling exploration program in the Cuajone mines and scheduled a more extensive diamond and churn-drilling program for the near future. A porphyry copper deposit in Moquegua department, in southernmost Peru, Cuajone is situated at about 10,000-ft. elevation and 110 km. inland, not far from American Smelting & Refining Co.'s Toquepala and Quellaveco copper mines.

★Iron ore produced in the **Marcona mines**, near Nazca in southern Peru, will be shipped by sea to Chimbote to feed the steel mill that Corporación Peruana del Santa will build. Initial steel production will be 60,000 tons a year. Peruana del Santa, recently reorganized for concentration on steel and coal production, already has contracts with French and Swedish firms, and some furnaces for the plant are now en route to Peru. Chimbote is the port from which Peru's largest coal producers ship for export.

IN AFRICA

★Inaugurating **Union of South Africa's first uranium-producing plant** on the West Rand, Premier Malan said the program for uranium-plant construction may exceed £40-million and would ultimately bring in gross revenue of at least £30-million a year.

The 13 gold mines already enlisted in the program would be augmented, he said. Need of importing additional sulphur supplies for uranium production is obviated, he declared, by plans of several participants to manufacture sulphuric acid from pyrites to be extracted from gold-bearing ores. While he forecast earning additional foreign-exchange credit and development of new resources of skilled and professional employment, Dr. Malan predicted the program in initial stages would impose a strain on the country's manpower, transport, power, and water resources.

★**O'Okiep Copper Co.**, announcing metal sales of about $19.5-million and after-taxes profits of $9.3-million in the fiscal year ended June 30, scheduled mining of its newly discovered Nababeep West orebody accelerated to 1,800-to-2,000 tons a day by 1957. It was felt that by that time the existing Nababeep mine will have been exhausted. The mills in the past year ground 972,200 tons of ore yielding 23,622 short tons of blister copper.

The year previous gave metal sales of $13.5-million and profits after taxes of $5.5-million. The company spent $1.4-million on capital items and authorized expenditure of an additional $3-million, including allocations to increase mill capacity for the O'Okiep mine from 35,000 to 50,000 tons a month and equip the tungsten mine to mill 200 tons a day.

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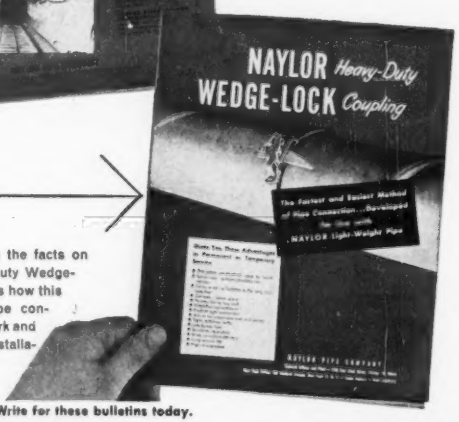

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IN ASIA

INDIA

★The government of Travancore-Cochin State was expected to appeal for federal aid to sustain **India's only titanium factory,** temporarily shut down on account of high production costs. The factory, which is in Trivandrum, capital of Travancore-Cochin, is 51% state government-owned.

IN AUSTRALIA

★Jubilant geologists, amazed at the number (said to be more than 50) of separate **uranium finds** indicated in the 200-mi. belt between Darwin and Katherine, have been expressing hope that the world's richest and biggest deposit is being uncovered. Ground parties are following up leads indicated by preliminary aerial survey concentrated in the Finnis River area. Most of this area is highly mineralized, embracing many abandoned tin, copper, tantalite, and gold mines.

Other promising uranium areas listed by the Department of National Development include the Cloncurry-Mt. Isa and Wolfram camp in the Mt. Garnet-Herberton area, Queensland; the New England tableland, New South Wales, and the Mt. Painter-Radium Hill-Broken Hill area, South Australia and New South Wales.

NORTHERN TERRITORY

★Prospectors are further exploring the Rum Jungle, heartened by reports that **copper found at Peko** seems to justify a considerable side-line operation to uranium mining.

★**Home of Bullion mine,** from which samples grading as high as 51% copper have been taken, is now in production, and work is proceeding rapidly on the 12-ft.-wide southern lode, of which the Territory's Director of Mines has said that it "may yet prove to be one of the most amazing finds of copper ever." Bulk ore from the lode grades as high as 50% copper. Minesite is near Barrow Creek.

SOUTH AUSTRALIA

★**Crockers Well,** about 40 mi. northwest of the buzzing activity of uranium mining at Radium Hill, is site of the latest uranium discovery in this territory. Provincial Premier Playford, noting that the new Crockers Well find extends the original discovery in that area and greatly increases first estimates of its magnitude, suggested further aerial survey might well be undertaken in other areas of South Australia.

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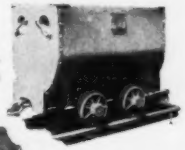
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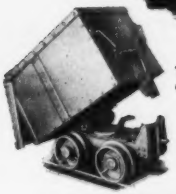
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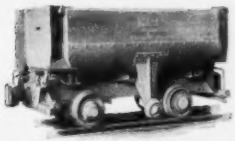
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TASMANIA

★**Accelerated copper output at Mt. Lyell** will account almost entirely for 1952 Australian production of 16,000 tons, representing an 18-to-20% increase over that of 1951. Shipments of coke have permitted treatment of some concentrate at Mt. Lyell. The rest is sent to Port Kembla for treatment.

VICTORIA

★**Gold Mines of Australia** is drilling and examining the Three Jacks mine at Stawell, which is a reef mine, not —as recently stated by some sources— a dredging proposition. Recent operations give rising hope the mine may eventually be worked.

WESTERN AUSTRALIA

★Young prospectors recently struck **a rich gold deposit** near the Wodgina mining locality south of Port Hedland.

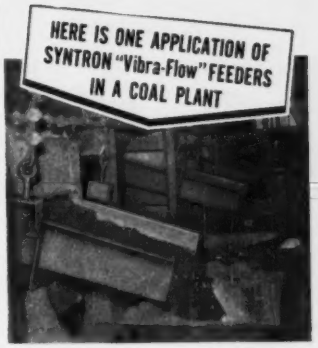
★Another important discovery, **a rich and extensive scheelite deposit** at Marble Bar near Mosquito Creek, is highlighted by a long hanging wall containing scheelite 2 ft. thick and assaying up to 60%.

★**New Coolgardie** gold output, hiked to counter effect of rising costs, is setting new company records. During the first 24 weeks of the current fiscal year, 15,171 oz. were obtained from 28,510 tons, while grade registered a rise from 9.8 to 12.8 dwt. a ton.

IN THE PHILIPPINES

★The Monetary Board temporarily suspended the regulation of the Central Bank that required **all Philippine gold mines** to turn in 25% of their monthly production to the government at the statutory price of 70 pesos an oz. This concession, long desired by the gold-mining industry, permits producers to sell their entire output on the open market, where the price, after declining below 100 pesos an oz. in late summer, steadied to 106 pesos at the end of October. On a monthly production of about 36,000 oz., producers would gain nearly $2-million additional revenue per year.

This concession to the hard-pressed gold miners followed rejection by the Labor Secretary a week earlier of the recommendations of wage boards for postponement for three to six months of minimum-wage increases in the mining industry. The Secretary's view was that any relief to the industry should come from other sources than labor. About 25,000 mine workers were affected by the decision.



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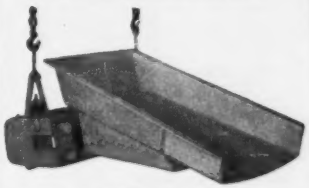

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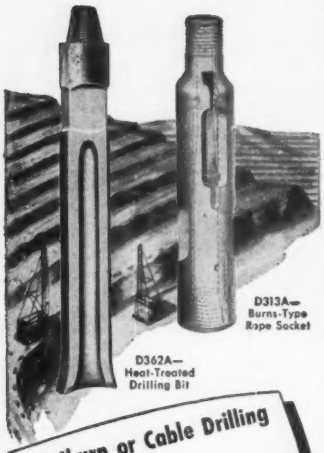

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Working Loads for Wire Rope

(*Continued from page 97*)

factors affecting its design, hence to avoid misinterpretation outside the engineering profession, we should perhaps use the more accurately descriptive term "design factor" instead of "safety factor."

The actual working load on a wire rope includes not only the dead load but also the added stresses resulting from acceleration, retardation, and shock from any other source. Rope life is affected by those factors and also the size of the sheaves, drums, and attachments, and the care it receives in operation. The equipment designer must, therefore, select the rope after considering all economic and design factors and, of course, the effectiveness of the machine as a whole.

"Design Factor" More Appropriate

Obviously it should not be said that a new rope, fully loaded to one-tenth, one-fifth or to even more than one-third of its minimum rated breaking strength is not "safe," for none will break under such loads. It can only be said that if all other operating conditions are the same, the useful operating life of the most heavily loaded rope will be the shortest. It may surprise many to learn that some rotary lines have been operated in deep-hole drilling with a factor as low as 2. Certainly, from the viewpoint of long rope life, a wire rope engineer would not normally look with favor on such a low design factor. It means relatively short rope life, and involves close attention and supervision, but other factors than rope life probably more than compensate for the more rapid rate of rope consumption. It should be obvious that "safety," when used in combination with "factor," is subject to gross misinterpretation, and "design factor" appears to be a far more appropriate term. It should also be obvious that the selection of a proper working load for any given rope involves considerations beyond that which will give maximum life under ideal conditions.

The wire rope manufacturer's advice on application problems is always available and is commonly helpful, but users should understand that the equipment designer, can in many cases also contribute valuable assistance.

WEIGH WITHOUT STOPPING
WHILE YOU CONVEY

Yes, weigh and record with the —MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service.

Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

MERRICK SCALE MFG. CO. PASSAIC N. J.

WEDGE-WIRE

REG. U.S. PAT. OFF.

Kleenslot

SCREEN GUARDS

(PAT. APPLIED FOR)

LONGER LIFE! Particularly adaptable for use at the discharge end of flumes. The guard is built right into the screen to keep the larger lumps of material above the guard bars permitting only the finer particles to pass over the screen. Precision made.

ECONOMY!! They are non-clogging, non-blinding, strong, rigid, uniform and consequently more economical in the long run.

SEND FOR OUR ILLUSTRATED LITERATURE

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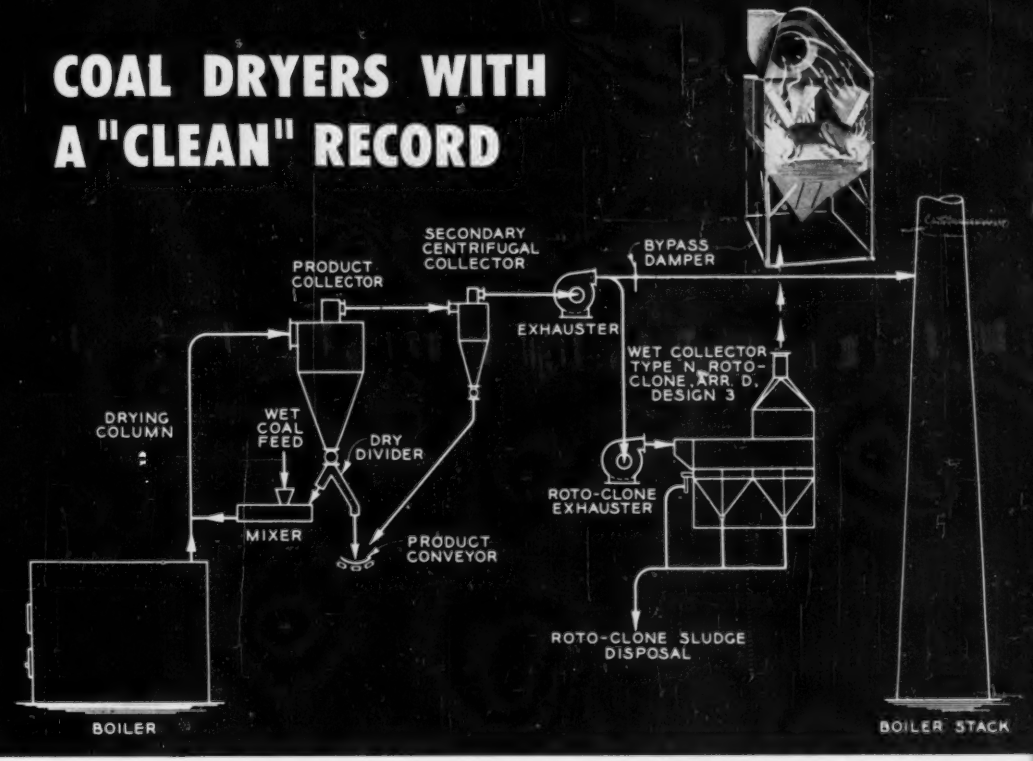
COAL DRYERS WITH A "CLEAN" RECORD



Type N Roto-Clone, Arrangement D—cutaway shows both distinctive water curtain and hopper design for sluicing collected material to disposal point.

Type N Roto-Clone Solves Toughest of Coal Dust Collection Problems

Efficient dust control of coal dryers poses a double problem. One, 99% of the dust particles are minus 10 microns and 90% minus 5 microns. Two, the moisture-laden, corrosive gases vented from the dryer at high temperatures restrict both the type of collector used and the materials used in its construction.

Solution? It's pictured above on this flow sheet of an actual installation. Here, two Type N Roto-Clones, Arrangement D, are handling the dust-laden gases from two flash dryers having a total capacity of 50 tons per hour. Each Roto-Clone*, exhausting 28,000 CFM, collects 285 lbs. of coal dust per hour. Final result — dust concentration in the effluent gases is reduced to 0.09 grains per cu. ft., a loading well below current air-pollution-control ordinances.

High collection efficiency on small particles; ability to handle high-temperature, moisture-laden gases; simplicity of design that lends itself to corrosion-resistant construction —these are the features of the Type N hydro-static precipitator which prompted its selection for this difficult job, make possible its success.

Regardless of the type coal dryer you use, AAF can supply similar proof of the Type N's ability to make "good citizens" out of these inveterate dust nuisances. For complete information, call your local AAF representative or write us direct for Type N Bulletin No. 277A.

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

American Air Filter
COMPANY, INC.

193 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

Use these "Agents"

FOR BEST RECOVERIES

Frothers

HERCULES YARMOR® F PINE OIL
Standard of quality among pine oil frothers since the early days of flotation. Yarmor F Pine Oil produces a strong froth of good volume, satisfactory texture, and excellent cell-life stability.

Collectors

RADA (Hercules Rosin Amine D Acetate)
Siliceous mineral collector that has good solubility and handles easily.

Rosin Amine Derivatives: Special purpose collectors; uses vary with type of materials to be floated.

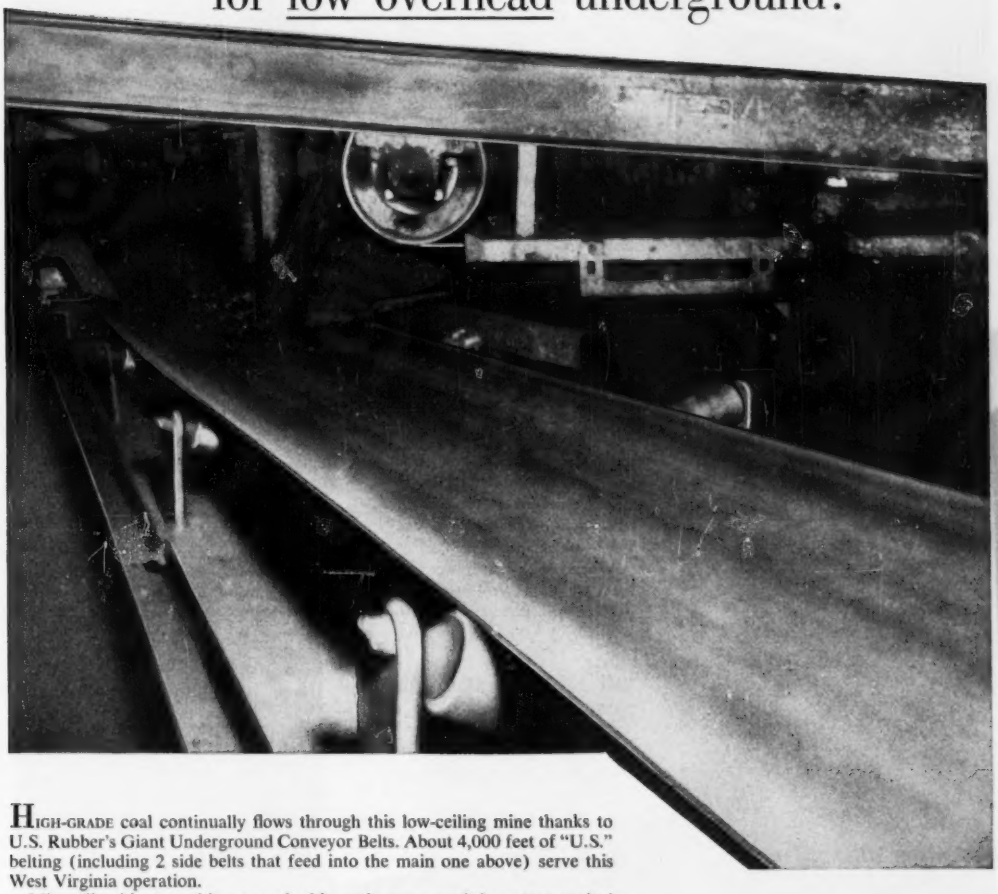
Technical information on these and other flotation aids is available.
Send for 16-page booklet "Flotation and Hercules Flotation Agents."

HERCULES Flotation Agents

HERCULES POWDER COMPANY Naval Stores Department, 933 King Street, Wilmington 99, Delaware

NM52-1

What's U. S. Rubber doing for low overhead underground?



HIGH-GRADE coal continually flows through this low-ceiling mine thanks to U.S. Rubber's Giant Underground Conveyor Belts. About 4,000 feet of "U.S." belting (including 2 side belts that feed into the main one above) serve this West Virginia operation.

Mines like this one, with extremely thin coal seams, need the most practical conveyance system possible to make them worth working. Conveyor belts keep overhead at a minimum because they require much less operating space than other conveyor systems. Smaller tunnels, simplified timbering, more mobility, healthier, safer operation—these are other advantages made possible by U.S. Giant Conveyor Belts.

For over two years now, this "U.S." belt has weathered the terrific beating of low-mine service, maintained alignment and has not required costly repairs. You can expect the same high standard of service provided by "U.S." technicians, no matter how complex your conveyor problem may be.

PRODUCT OF U.S. RUBBER SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

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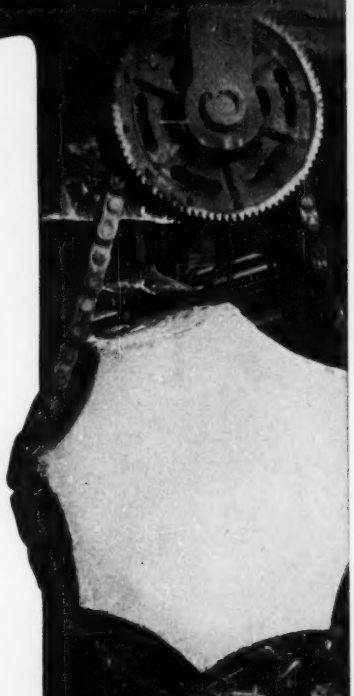
Better FORGINGS

Midvale Quality Control
From Furnace to Finish
Assures Longer Service

From the time the scrap and pig iron are charged into the furnaces until the forging is machined to a precision finish Midvale craftsmen carefully control quality.

Weldless gear rings . . . hydraulic press cylinders . . . pressure vessels . . . hardened and ground steel rolls . . . all are produced to exact specifications at Midvale. Modern equipment, complete facilities, skilled and experienced men make a combination that America's industries have relied upon for almost a century for the finest in heavy steel forgings.

When heavy forgings must meet rigid specifications, rely on Midvale precision craftsmanship and engineering cooperation.



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Custom Steel Makers to Industry

PRODUCERS OF FORGINGS, ROLLS, RINGS, CORROSION AND HEAT RESISTING CASTINGS

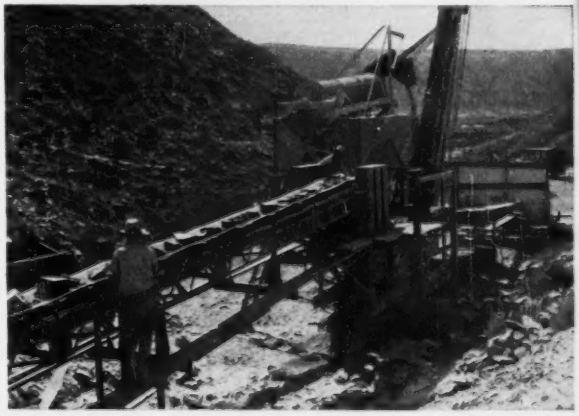
Nothing too rough or tough for Thermoid Conveyor Belting

Thermoid's long experience and continuing research *in the field*, pays off with real economy, maximum efficiency and greater tonnage for your belting dollar. Regardless of the size or kind of material—light or heavy, soft or abrasive, hot or cold, wet or dry—whatever the job, it's a good bet that Thermoid has solved the same or a similar problem with a belt that will do the job better.

In most cases, your Thermoid distributor can select the belt that will serve your needs most economically. Where unusual conditions exist, he will call in an experienced Thermoid sales engineer.

Get in touch with your Thermoid distributor or write direct for a copy of the Thermoid Conveyor Belting Catalog No. 3679.

It will pay you to specify Thermoid



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F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

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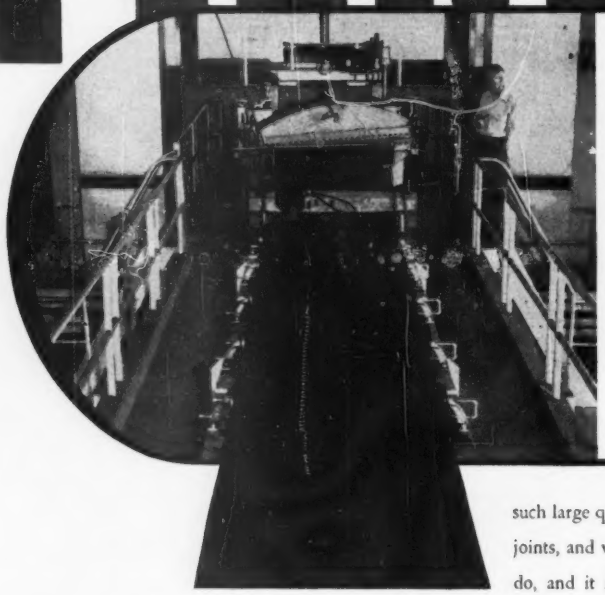
Industrial rubber products especially built for LONG SERVICE

PIONEER



Pioneer Products get tough test in sewage treatment plants

This Pioneer belting is being installed for production of 220 tons of excellent fertilizer a day at the Los Angeles Hyperion Activated Sludge Plant. At storm peak, this plant handles *420 million* gallons a day.

The sweet fresh air and sparkling clean surrounding in this and other modern sewage plants give no indications of the strong chemicals, oils, and gases which are present in such large quantities. Rubber linings, gaskets, packing, belts, joints, and various types of hose have a most difficult job to do, and it is noteworthy that Pioneer Products across the country are doing it so exceptionally well in many installations.

Why? Aside from ability and experience (64 years of it), the Pioneer organization has the *willingness* to study your use of industrial rubber and to deliver either the standard or special product that will do your job *best*.

Plan now to get acquainted with Pioneer Industrial Rubber Products through your nearest Pioneer representative.

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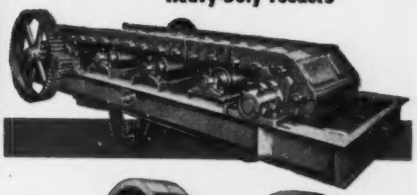
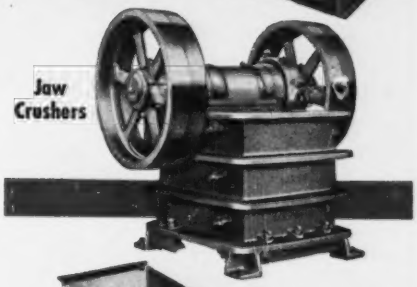
EQUIPMENT FOR MINES

Heavy-Duty Feeders

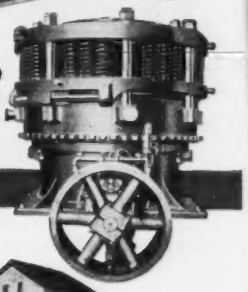


Jaw Crushers

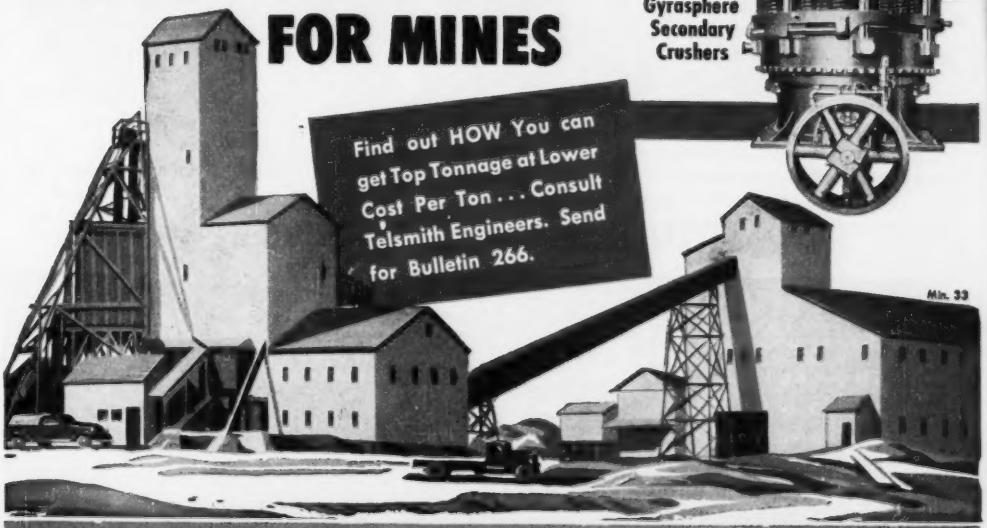


Vibrating Screens

Gyrasphere Secondary Crushers



Find out HOW You can get Top Tonnage at Lower Cost Per Ton . . . Consult Telsmith Engineers. Send for Bulletin 266.



Min. 33

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4500
REACH....
More and more of the leading strip operators and contractors are switching to the big, powerful Manitowoc 4500. It's the real sensation of the mining industry . . . sensational in design and performance. As a shovel, it ranges from 4 yds. on a 60′ boom, 5 yds. on a 50′ boom, 5½ yds. on a 40′ boom. As a dragline, it ranges up to a 140′ boom. And there's power-a-plenty in its rugged 375 H.P. Diesel.
STABILITY...POWER
It's packed with extra features . . . fewer gears, all enclosed running in oil; high speed shafts on ball or roller bearings; simple, independent cable crowd; single, tubular stick rolls through saddle but is free to turn. Ships on standard flat cars with minimum dismantling. Unload and erect in 3 to 5 days.
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SHOVELS
1-5 YD.
MANITOWOC
Speedcrane
CRANES
18-100 TON
WISCONSIN

This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.

This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.

These are the cost-reducing Blowers that give up to 100% more air

Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corp., Worcester 2, Mass.

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Name .....

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Washed iron ore is stacked at rate of 600 long tons per hour by this 570 ft. track-mounted trailer belt conveyor (fed by fixed belt conveyor) and Link-Belt 115 ft. radius revolving, self-propelled stacker, which can make storage pile 42 ft. high.

Rely on one source... one responsibility for the best in belt conveyors

LINK-BELT engineering experience plus quality components combine to cut handling costs

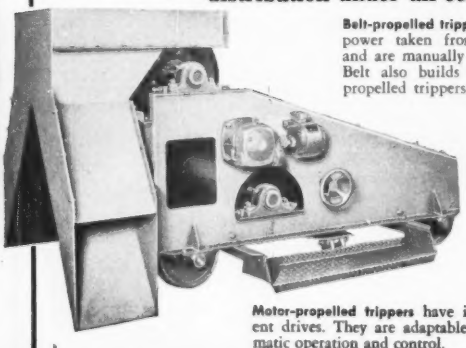
WHETHER you must move a few tons a day or several thousand tons per hour . . . whether the haul is measured in feet or miles—you'll find the answer in belt conveyors at Link-Belt.

Here's a nation-wide engineering organization that will follow through from start to finish—the designing, manufacturing, erecting of conveying equipment. And nowhere can you match Link-Belt's combination of vast application experience . . . complete line of quality components . . . expert coordination of related equipment.

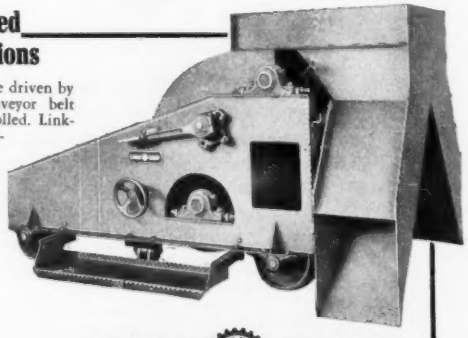
Get all the facts from the Link-Belt office near you. Link-Belt engineers are glad to work with you and your consultants—help you get the finest in belt conveyors.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

LINK-BELT Trippers offer controlled distribution under all conditions



Belt-propelled trippers are driven by power taken from conveyor belt and are manually controlled. Link-Belt also builds winch-propelled trippers.



Motor-propelled trippers have independent drives. They are adaptable to automatic operation and control.

12,585-B

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BELT CONVEYOR EQUIPMENT

for lower **first** and **last** costs

power with this tough cable

ANACONDA

BUTYL-INSULATED HIGH-VOLTAGE CABLE

—easier to install—lasts longer

—handles better

Mine after mine comes up with the same answer. So do pit and quarry operators. *It pays to use this modern power cable*—ANACONDA Type AB*, for uses up to 15 kv. It is exceedingly hard to damage by impact, crushing, twisting or abrasion. Butyl insulation has superior long-aging characteristics, improved resistance to moisture, ozone, heat. Neoprene jacket—as tough as they come—has real flexibility and great strength. This cable handles well and lasts longer in all weather. It has high dielectric strength, affords excellent protection against acids, oils, and even flame.

Our mine specialists will gladly show you a sample of this safety cable. And they can also show you just the right cable for your shovels, drills, shuttle cars, and the new continuous mining machines. See how recent improvements have made famous ANACONDA Securityflex* portable cables even better. Call your nearest Anaconda Sales Office or Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

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- *butyl insulation*
- *neoprene jacket*
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the right cable for the job **ANACONDA®** wire and cable

Seasons Greetings
made with brick!

● Those bells that ring out Yule . . . the electric train under the tree . . . the piles and piles of packages—most everything we enjoy at Christmas owes its origin, in part, to *refractory* brick.

● Without refractory brick to line the furnaces of industry there would be no heat, light or power, no paper, no metal, no manufacturing, no transportation.

● Next to agriculture, there is no more vital contribution to the economy of our nation than such heat-resisting refractories products as those made by Grefco. From Grefco mines and plants—here and overseas—General Refractories Company is supplying brick, mortars, plastics and castables to serve our nation in times of peace and in times of problem.

● At this time of year let us hope it will be peace. But whatever problem we must face, let's make sure American men and American industry are ready to measure up!

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Deliver Higher Efficiency and Economy

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SUPERLATIVE PERFORMANCE of Sheffield Moly-Cop grinding balls is the result of years of research, and quality-controlled methods of manufacture—from initial alloy steel production to final heat treatment.

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Bonus Benefits

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QUALITY?

Does your present wire rope *deliver top tonnage*?

Have you considered the extra *labor-savings* resulting from less frequent replacement with Hercules* Red-Strand?

Do you know that these two benefits are top ones with Hercules Red-Strand wire rope users?

Are you getting wire rope that is manufactured with the precise care . . . the exacting insistence upon *higher-than-rated* quality . . . and the specialized craftsmanship that goes into Hercules Red-Strand wire rope?

If you're not sure . . . FIND OUT

It means money to you. Leschen wire rope specialists will help you answer these questions . . . to your profit. There's no obligation. Ask them.

Write for your free copy of "Use and Care of Leschen Wire Rope."

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In business only to make wire rope — better wire rope — since 1857.

*Reg. U. S. Pat. Off.

Preformed • Round Strand • Flattened Strand • Non-Rotating • Locked Coil • Slings

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Safe MINING EQUIPMENT

Economical-Rugged!

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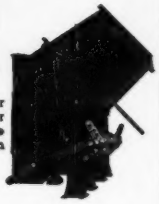
Single or double deck types. Capacities from 1 to 90 men.

BOTTOM DISCHARGE SKIPS
Built to "take it" in 1 to 25 ton capacities.

SKIP LOADING CHUTES
Operated either by skips or air cylinders. Toggle locked when closed.



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Bicycle type with renewable special steel liners. Up to 16 ft. dia. with plain or anti-friction bearings.

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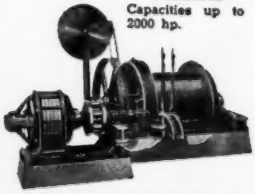
Capacities up to 2000 hp.



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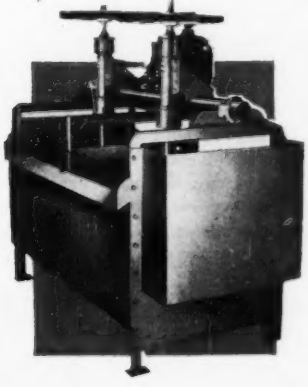
Lead-zinc cleaning section at one of the largest concentration operations in the world.

Operation AGITAIR



Here, as in many other large plants throughout the world, Agitair is the key to efficient metallurgy.

Its adoption is based on such factors as low cost of operation and maintenance; low power consumption; flexibility and ease of control; minimum wear and tear on mechanism and rubber parts.

The leadership of Agitair in the field of metallurgy has been built on close collaboration among field men, mill men and Galigher engineers.

Write for Bulletin 48 for full data on Agitair and Galigher Ore Testing Service.

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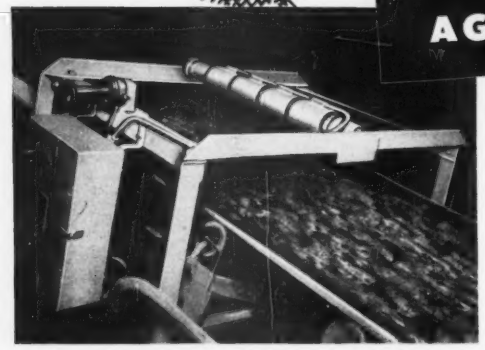
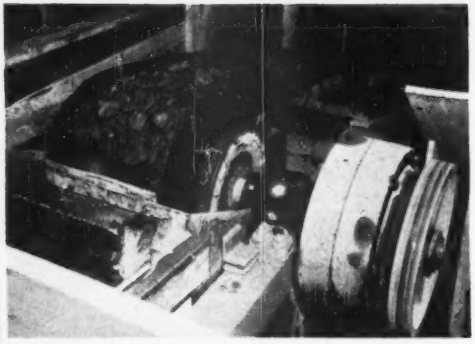
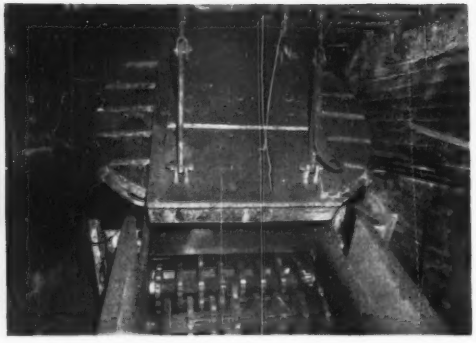
MATCH THESE MAGNETS AGAINST TRAMP IRON







There's a DINGS to handle each job — best

DINGS DETECTOR

Sharp-eyed Detector spots iron in deepest burdens and stops belt instantly . . . can be adjusted to pass small iron particles.

Used alone when iron is infrequent, Dings Detector is often installed ahead of pulleys and suspended magnets to stop belt for removal of large, unwieldy rails, rods or pipe that could damage belt, cause mechanical trouble. Send for bulletin.

DINGS PULLEYS

Here's perfect low cost iron removal for normal belt burdens. Dings electric or non-electric Alnico pulleys—strongest you can buy—hold magnetics in an iron grip, discharge them separately. Ask for catalog.

NEW DINGS RM SUSPENDED MAGNET

For pulling iron from fastest belts, deepest burdens, here's the mightiest member of Dings force —RM models available to pull iron through 30 inch air gap. New Dings RM uses less current, weighs less in proportion to strength—radical pancake design takes less room, dissipates heat faster. Write for bulletin on the most powerful rectangular magnet yet.

DINGS MAGNETIC SEPARATOR CO.

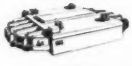
4716 W. Electric Ave., Milwaukee 46, Wis.

These are only a few-

get the complete story on the most powerful line of magnetic separators available—in Catalog C-5000-B, write:

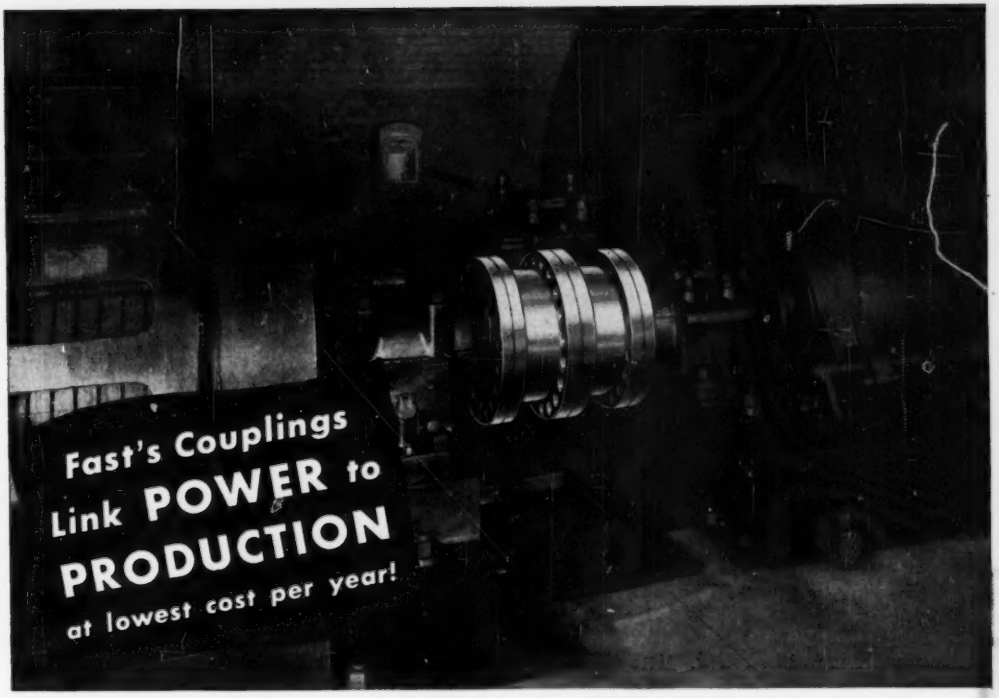
DINGS MAGNETIC PULLEYS — ELECTRIC AND NON-ELECTRIC PERMANENT

DINGS NON-ELECTRIC PERMA-DRUMS



DINGS RM RECTANGULAR SUSPENDED MAGNETS

DINGS MAGNETS



Over half a million FAST'S Couplings now in use!

THROUGHOUT industry, Fast's are rated the most dependable couplings on the market... to the tune of over half a million now in service! Year in, year out, they continue to *outlast the equipment they connect* . . . save time, maintenance and money by eliminating costly coupling failures.

Actual cases on record show many Fast's Couplings have been in operation for 25 and 30 years without trouble. And every major producer of high-speed equipment now uses Fast's!

Solve your coupling worries! Write today for full details on Fast's Couplings and Koppers Engineering Service to: KOPPERS COMPANY, INC., *Fast's Coupling Dept.*, 392 Scott St., Baltimore 3, Maryland.

Here's How FAST'S Save You Money

Free Service—Koppers free engineering service assures you the right coupling for the job.

Rugged Construction—Fast's still maintains its original design, without basic change or sacrifice in size or materials. Result: freedom from expensive coupling failures.

Lowest Cost per Year—Fast's Couplings usually outlast equipment they connect. Their cost may be spread over many years!

KOPPERS

FAST'S
THE ORIGINAL
GEAR-TYPE
Couplings

INDUSTRY'S STANDARD FOR 32 YEARS

KOPPERS COMPANY, INC., *Fast's Coupling Dept.*
392 Scott St., Baltimore 3, Md.

Gentlemen: Send me Fast's Catalog which gives detailed descriptions, engineering drawings, capacity tables and photographs.

Name .....

Company .....

Address .....

City ..... *Zone* ..... *State* .....

Your Management wants to know...

How valuable dust recovery saves dollars

. . . .

In every industry, from ore to fabric to steel, Buell engineers, working with plant engineers, have established an enviable 18-year record of turning unnecessary dust losses into substantial new profits. What's more, a Buell Dust Recovery System uncovers these additional important advantages: improved product quality, smoother plant-community relations and higher employee morale.

To take advantage of Buell's background and experience in the highly specialized science of Dust Recovery, ask for further information about Buell's **3 basic systems** of dust collection. See how they can help you turn dust into dollars. Send for Buell's new, informative bulletin titled, "The Collection and Recovery of Industrial Dusts." Buell Engineering Company, Dept. 19-L, 70 Pine Street, New York 5, New York.

Van Tongeren Cyclone

'SF' Electric Precipitator

Precipitator-Cyclone Combination

Type 'LR' Collector

Dust Hopper Valves

ELECTRIC CYCLONIC ® buell

ENGINEERED EFFICIENCY IN DUST COLLECTION

TAILORED TO FIT YOUR NEEDS...

Smelter bags of tailor-made **FUMEALL** filter fabric are now operating in the bag houses of many of the world's most important smelters. The operating records of **FUMEALL** filter bags show substantial savings over conventional fabrics...often giving as much as four times the service of all-wool bags.

FUMEALL, a combination of virgin wool and Dynel, combines the undisputedly superior filtering qualities of wool with the strength, heat, acid, alkali and moisture-resistance of Dynel.

FUMEALL is tailor-made to the exact porosity and weave which meet your specific requirements . . . **FUMEALL** can be ordered as yardage or as completely fabricated bags of any size and specification.

INDUSTRIAL FABRICS DIVISION

Portland Woolen Mills, Inc.

P.O. Box 2620 • Portland 3, Oregon, U.S.A.

DO YOU "STACK" MATERIALS?

DO IT BEST WITH BARBER-GREENE CONVEYORS!

If you "stack" or stock-pile materials, quite probably you can streamline your operation with a Barber-Greene Stacker Conveyor.

Stacker Conveyors—a Barber-Greene development—deliver more material at less cost. First of all, the initial cost is less because you build up system with components selected from the complete, standardized B-G line, eliminating the expense involved in designing and erecting a "tailor-made" system. Secondly, you save during the system's entire life, thanks to reduced operating costs.

There are three basic stacker conveyors—radial, traveling and fixed types—and your B-G distributor is ready to assist you in selecting the kind best suited to your needs.

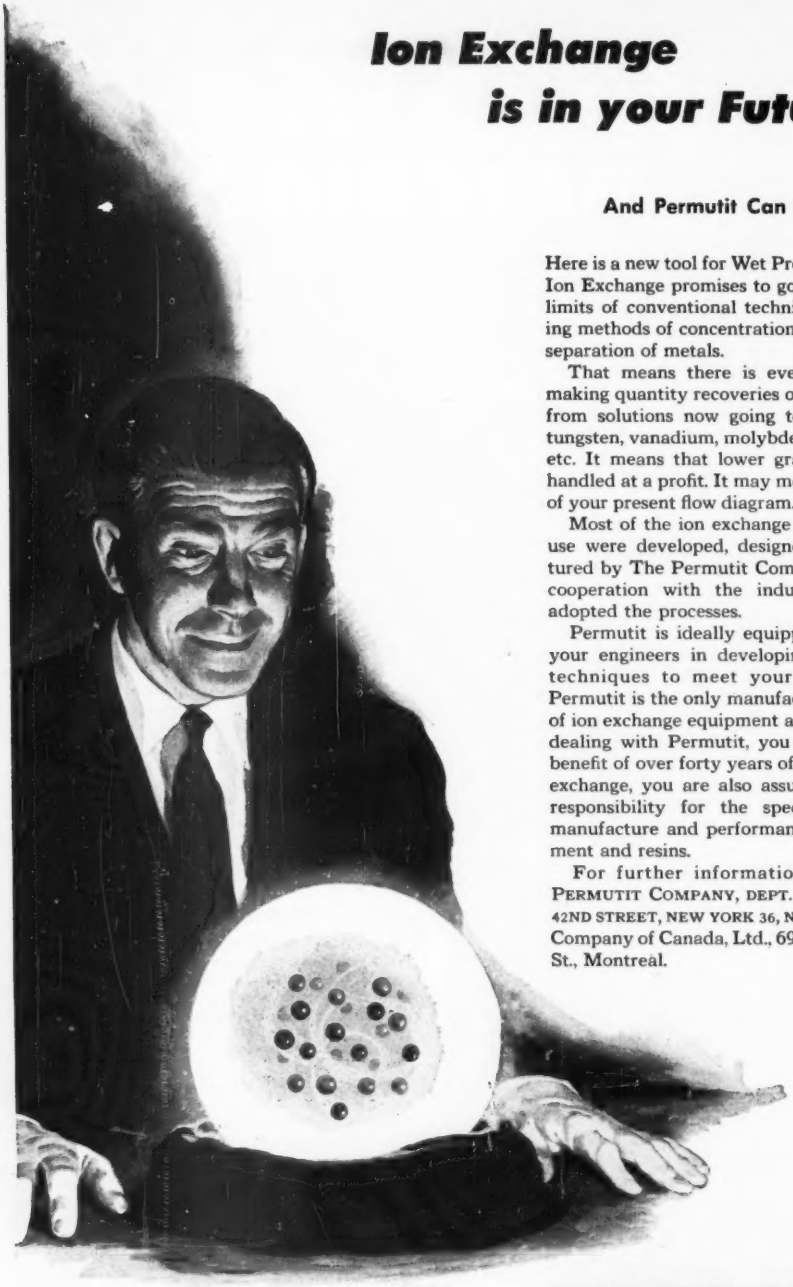
TYPICAL STACKER APPLICATIONS

- For the stock-piling of bulk materials such as sand, gravel and aggregates
- In mining operations where ore or coal is stock-piled to suit market or seasonal conditions
- In material yards, ready-mix plants or coal yards where classification into separate bins or large stock piles is advantageous for meeting peak demands
- For disposal of waste material
- Wherever structural supports in stock pile handicap operation of reclaiming machines

write for information!

Barber-Greene

Aurora, Illinois, U. S. A.



Ion Exchange is in your Future!

And Permutit Can Supply It!

Here is a new tool for Wet Process Metallurgy. Ion Exchange promises to go way beyond the limits of conventional techniques in developing methods of concentration, purification and separation of metals.

That means there is every possibility of making quantity recoveries of valuable metals from solutions now going to waste: copper, tungsten, vanadium, molybdenum, gold, silver, etc. It means that lower grade ores may be handled at a profit. It may mean simplification of your present flow diagram.

Most of the ion exchange processes now in use were developed, designed and manufactured by The Permutit Company . . . often in cooperation with the industries that have adopted the processes.

Permutit is ideally equipped to work with your engineers in developing Ion Exchange techniques to meet your specific needs. Permutit is the only manufacturer of all types of ion exchange equipment and resins. Thus in dealing with Permutit, you not only get the benefit of over forty years of experience in ion exchange, you are also assured of undivided responsibility for the specification, design, manufacture and performance of both equipment and resins.

For further information, write to THE PERMUTIT COMPANY, DEPT. EMJ-12, 330 WEST 42ND STREET, NEW YORK 36, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance St., Montreal.

PERMUTIT®

ION EXCHANGE & WATER CONDITIONING HEADQUARTERS FOR OVER 40 YEARS

MORE EFFECTIVE SHOTS

you can plan your shots better when you "Hook up and Detonate with PRIMACORD"

Using Primacord you get faster, easier loading; the positive firing of every dynamite cartridge in every hole – be they wet or dry; the shooting of as many holes as you wish; the most efficient use of your men and mobile equipment regardless of the terrain or the weather. And correctly hooked up, you can shoot the front holes a split second ahead of those behind, giving you relief from burden and better fragmentation. All of which means easier digging, larger daily yardage.

Your men will like it, too. It's less hazardous – it cannot be set off by friction, sparks, ordinary shock or stray electrical currents . . . yet it fires instantaneously from a blasting cap.

***Plan your shots for bigger payloads with* PRIMACORD**

Ask your explosives supplier or write us direct for further facts

THE ENSIGN-BICKFORD COMPANY
SIMSBURY, CONNECTICUT
Also Safety Fuse since 1836

There's a type for every job. **PLAIN PRIMACORD** for shallow holes and surface trunk lines; **REINFORCED PRIMACORD** for deep holes and resistance to abrasion; **WIRE COUNTERED PRIMACORD** for deep, ragged holes; and **PLASTIC REINFORCED PRIMACORD** for deep holes and unusual wet conditions.

Use PRIMACORD®

The PROVED and APPROVED DETONATING FUSE

Your *SAFEST* buy in wire rope blocks

Load-Rated!

Here's a common-sense way to avoid the risk of accidents. American CROSBY Blocks are LOAD-RATED . . . safe working capacity permanently embossed in the side plate . . . so your men can *know* what load the block will carry.

PACKAGED

Your load-rated CROSBY blocks come in individual, factory-sealed cartons. Easy to buy, easy to stock and handle; delivered to the job in perfect working order. Sold by leading distributors everywhere.

American CROSBY

Load-Rated Wire Rope Blocks

Made by the makers of genuine Crosby Clips:

AMERICAN HOIST & DERRICK CO., ST. PAUL 1, MINNESOTA

Puts fresh air where you want it—*Anywhere*

Mine-Vent Tubing is made to go anywhere that fresh air is needed . . . with fittings available for every conceivable coursing dip, curve or bend. Yet, Mine-Vent is easy to move: Patented snap-on couplings and simplified hangers will save you countless hours of installation time. One man can hang 100 feet of Mine-Vent an hour with ease. with flexing.

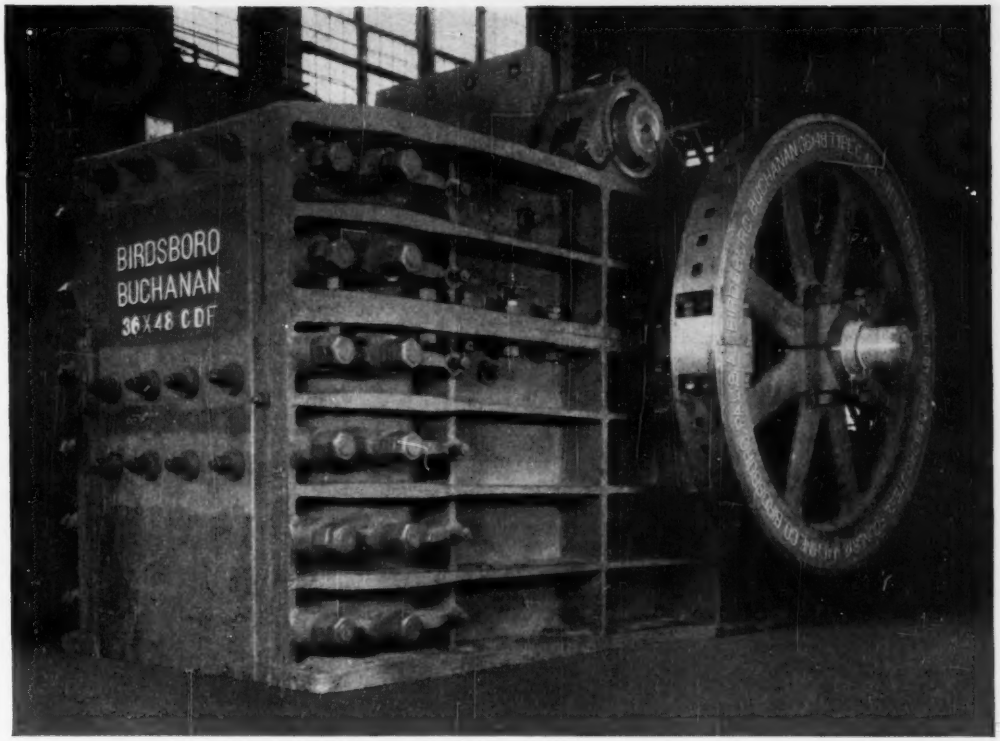
Write us your ventilation needs . . . now.

AMERICAN BRATTICE CLOTH CORP., 220 Buffalo St., Warsaw, Indiana

"Canned" for your convenience

Durable, easy-to-handle fiber drums keeps MineVent in perfect condition until you need it

MineVent Tubing



Keep up with the latest crusher developments . . . Send for this Type C Crusher Catalog on your company letterhead without delay . . . And if you have a special crushing problem, call in a Birdsboro engineer.

BIRDSBORO-BUCHANAN CRUSHERS

Built to Cut CRUSHING COSTS

with Dependable, Trouble-Free Operation

Birdsboro-Buchanan Crushers, in day-in and day-out service on hundreds of mining and quarrying operations, have proved their efficiency in the fast reduction of all types of rock and ore while providing substantial power savings and reducing maintenance costs.

These units are simple in design and ruggedly built with deep, strong all cast steel frames—and jaw openings from 24" x 36" to 66" x 84" to handle all primary crushing assignments.

Canadian Representative & Manufacturer
JOHN INGLIS CO., LTD.
TORONTO, CANADA

World-Wide Agent Representation. Contact home office for nearest representative.

BIRDSBORO BUCHANAN JAW CRUSHERS

2-48-R

BIRDSBORO
STEEL FOUNDRY & MACHINE CO.
Birdsboro, Penna.

Designers and Builders of:
Crushing Machinery • Rolls • Steel Mill Machinery
Hydraulic Presses • Special Machinery • Steel Castings

THE First

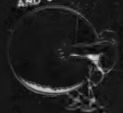
AND STILL THE FINEST BEARING OF ITS KIND

ConCaVeX DESIGN GIVES YOU BEARINGS THAT

Originated by Shafer over 3 decades ago, ConCaVex is still the "years ahead" design in roller type bearings. It has met all challenges—shown all industry what the words "anti-friction-efficiency" really means! This basically superior ConCaVex design combines in one bearing the distinct structural and operational advantages of both ball and roller type bearings. Installed in your product or your plant equipment Shafer ConCaVex Bearings will improve your ability to produce a quality product more efficiently at less cost. Ask for full information and engineering assistance. No obligation.

SHAFER BEARING CORPORATION
801 BURLINGTON AVENUE
Downers Grove, Ill.

. . . ARE COMPACT AND STRONG



. . . HAVE RESERVE CAPACITY FOR SHOCK LOADS

SHAFER

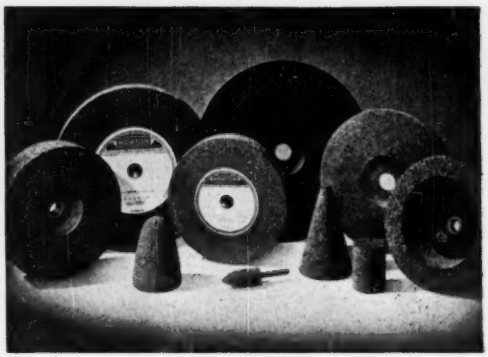
SELF-ALIGNING
ROLLER BEARINGS
INDUSTRIAL • AIRCRAFT

. . . HAVE AUTOMATIC SELF-ALIGNMENT

. . . STAY STRONGER YEARS LONGER

. . . CARRY RADIAL-THRUST LOADS IN ANY COMBINATION

. . . WITHSTAND GREATER THRUST LOADS



You can save on every grinding job with Norton wheels

For every grinding job you do, below ground or above, there's a Norton wheel with just the right combination of abrasive, bond, grain size and structure to save you time, labor, and money. For example:

- Norton ALUNDUM* wheels cover the widest range of applications. They're unequalled for sharpening high-speed steel tools and for grinding other hard, high-tensile-strength materials. E.g. A30-05VBE.
- Norton regular 37 CRYSTOLON* wheels assure maximum economy in grinding gray iron and the non-ferrous metals. E.g. 37c2.4-Q5V.
- Norton green 39 CRYSTOLON* wheels in the new vitrified K-bond are particularly adapted for sharpening carbide tipped bits and cutters. E.g. 39c60-I8VK.

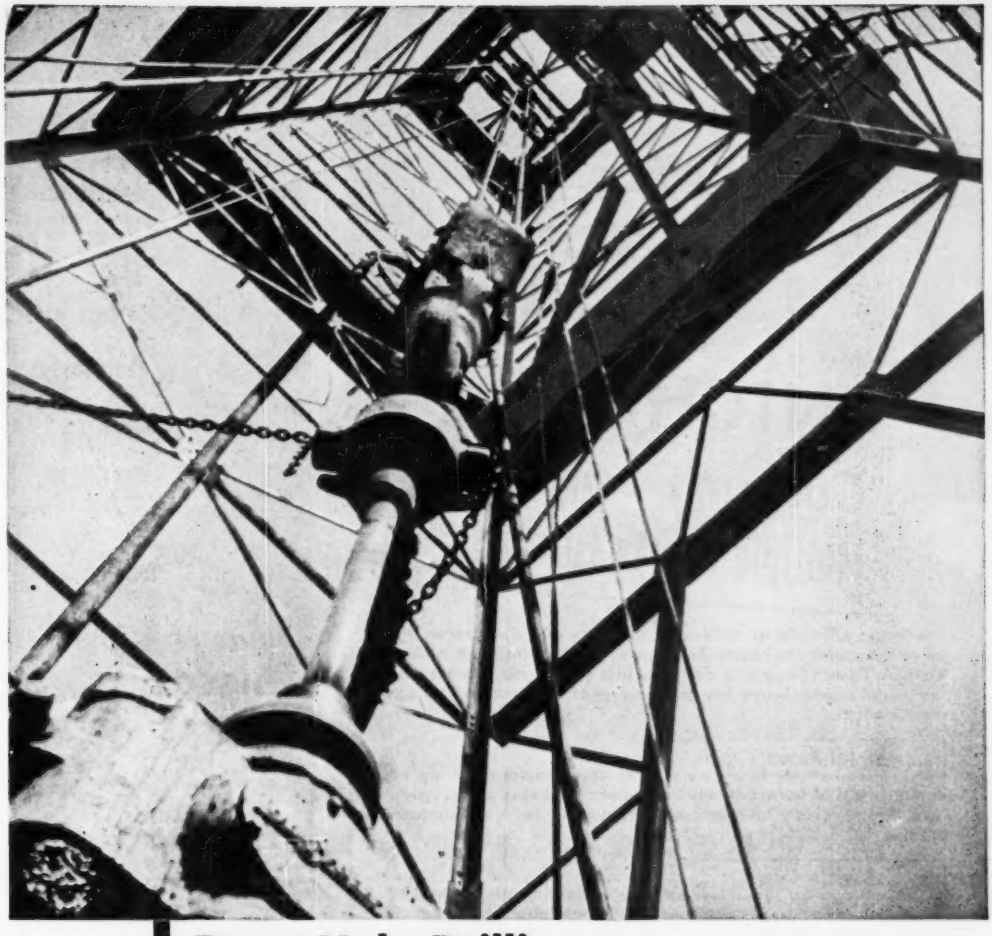
In Norton *Reinforced* Hub wheels, resinoid bonded, safety and versatility are emphasized. Their uses on portable grinders include weld grinding and other smoothing operations, also cutting-off and notching.

Your Norton Distributor Can Give You Valuable Help

Besides his own practical experience with abrasive applications in the mining field, your Norton Distributor can call in Norton Abrasive Engineers for additional expert aid in solving your grinding problems. Take advantage of the wide store of helpful knowledge he makes available to you. See him for the right wheels to use in any grinding job. NORTON COMPANY, WORCESTER 6, MASS. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES
Making better products to make other products better



. . . Cores Tell The Story

Deep Hole Drilling . . .

with speed and economy is provided by Longyear Contract Drilling Service. Rapid drilling progress is obtained by modern equipment like this new Longyear deep hole drill. Maximum core recovery is assured by skilled Longyear crews experienced in recovering cores from all types of formations.

Whatever your drilling needs—deep hole or shallow with a "turn-key" job—Longyear Contract Drilling Service will satisfy them quickly and economically.

Write today for complete information without obligation.

* * * * *

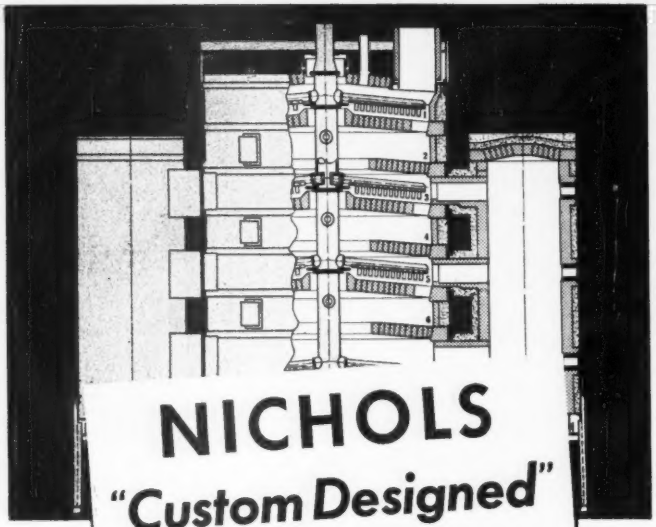
The Longyear DH-5 deep hole drilling rig is now available to purchasers who prefer to do their own drilling. Write for New Bulletin.

E. J. LONGYEAR COMPANY

1700 FOSHAY TOWER — MINNEAPOLIS, MINNESOTA, U. S. A.

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS



NICHOLS
"Custom Designed" Multiple Hearth Furnaces

The basic principle of Nichols Multiple Hearth Furnace design permits adaptability to a wide range of specific uses. Each Nichols Multiple Hearth Furnace is designed and constructed to meet your individual needs. Below are listed a few of the available design modifications.

Indirect Fired Type — For applications requiring no impingement of burner flames upon materials being processed or involving relatively low temperatures and/or unusually uniform product.

Muffle Type — For recovering gases evolved by decomposition, without dilution or contamination by products of fuel combustion. Design permits extremely close temperature and atmospheric control.

Ore Reduction Type — Solid, liquid or gas reducing agents can be introduced with the feed or introduced at any intermediate hearth. Infiltration of air excluded to maintain a reducing atmosphere in the hearth spaces.

Gas Recirculation Type — Gas recirculation provides an added means for the control of temperature and/or atmosphere. Exit or combustion gases may be introduced to any hearth to achieve desired results.

Please write for Bulletin No. 224 for more detailed information.

Nichols Engineering & Research Corporation
70 Pine Street, New York 5, N. Y.
1920 N. Meridian St., Indianapolis 7, Ind.
40 S. Los Robles Ave., Pasadena 1, Calif.
1477 Sherbrooke St. W., Montreal 25, Canada

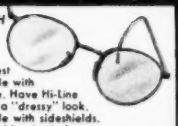
WILLSON
dependable eye protection

keep on the safe side

wear WILLSON SPECTACLES

Combined protection, comfort and appearance make Willson safety spectacles outstanding in value. Choose from a full range of metal and plastic frames—fitted with Super-Tough* heat-treated glass lenses, or Plas-Tough* plastic lenses—every one tested for impact resistance and optical quality. Send for catalog describing our complete line of safety equipment.

STYLE AH



METAL FRAME Latest style spectacle with single bridge. Have Hi-Line temples with a "dressy" look. Also available with sideshields. (Non-flammable plastic frame Style WKS shown at top.)

CHOOSE YOUR FAVORITE LENSES FOR ANY WILLSON SPECTACLES

Super-Tough* Plas-Tough* Willsonite*

Three popular types of lenses are available for all Willson Spectacles. Clear glass Super-Tough*, Willsonite* Green Super-Tough* and the new Plas-Tough* lenses that combine the impact resistance of heat-treated glass with the comfort of lightweight plastic.

*Trademark

See your Willson distributor or write for Catalog
WILLSON PRODUCTS, Inc.
225 Washington St., Reading, Pennsylvania

COMBINED IN

"MOLD-CURED" HAZACORDS

FOR LONGER LIFE . . .

LOWER CORD COSTS FOR YOU

You've probably found it true too, that the service life of portable cords and cables — the true measure of cable economy — depends primarily on the toughness, lasting qualities and flexibility of the sheath. Today's Hazacords are the result of many years of Hazard and Okonite experience in developing portable cable and cords for unusually severe service in every type of industry.

Every Hazacord is protected with the specially developed Hazaprene ZBF Sheath. *It's cured under pressure in a continuous metal mold* which assures optimum vulcanization, maximum density, lasting toughness, a smooth, wear-resisting surface — and at the same time, ample flexibility is maintained. The Hazaprene ZBF Sheath is a time-proved neoprene compound with maximum resistance to oils, acids, chemicals, moisture and weather. In addition, it is highly flame-resistant — more than meets the flame test requirements of the Federal Bureau of Mines and the Pennsylvania Department of Mines. All Hazacords are insulated with tough, heat-resisting, long-aging rubber compound for full electrical protection.

It will pay you to get all the facts about Hazacord. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD

Battery Power Saves Money for You on

ACCIDENTS THAT NEVER HAPPEN!

The Gould "Thirty"—
America's Finest
Mine Shuttle Car Battery

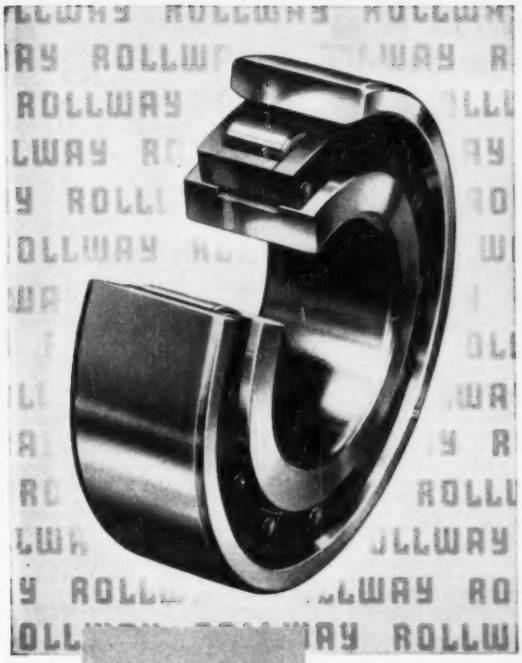
If you're already using lead-acid battery-powered shuttle cars, get full details on the Gould Plus-Performance Plan—a library of technical information that tells you how to select, charge, maintain and determine the condition of lead-acid batteries. It's free. Write Gould Battery Information Headquarters for details.

The accident curve goes down . . . the profit curve goes up, when a mine changes to battery-powered shuttle cars! A comprehensive, independent survey shows that battery cars have a much better accident record on a "per shift" or "per ton" basis. Mines using them save money on the accidents that never happen.

GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries



In-Built Trueness...

basis for longer life and lower cost!

Unwavering right-line rotation . . . that's the immediate result of in-built trueness in Rollway roller bearings. There's no skew, no side-shock, no roller-end-drag. Internal forces are balanced by matchless precision in related parts. Bores are precisely cylindrical. Separator surfaces are rigorously parallel. Roller ends are truly square on every diameter. And bearing surfaces match both the separator slots and the roller races.

Over the long run, life expectancy is greatly extended. Cost per unit of time falls sharply.

RIGHT-ANGLE
ROLLER ENDS, precisely square to avoid end-rub, oscillation and side-shock.
RIGHT-ANGLE
BEARING SURFACES with parallelism that results in unwavering rightline rolling.
RIGHT-ANGLE
SEPARATOR SLOTS accurately machined to prevent roller skew, slide and uneven wear.

Rollways Roll Right Because They're Made Right

Let our engineers help you to select the Rollway bearing that is exactly right for your application. Our years of specialized bearing experience and complete engineering and metallurgical service are always at your command. No cost. No obligation.

Nationwide Replacement Service: Rollway bearings are available for replacement through authorized bearing distributors in principal cities. To locate, consult classified 'phone directories under BEARINGS. Rollway Bearing Co., Inc., Syracuse 4, N.Y.

SALES OFFICES

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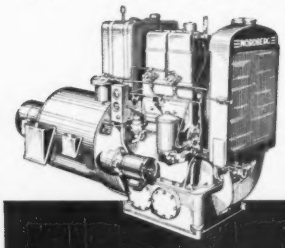
ROLLWAY BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings

HERE IS "Packaged"

DIESEL POWER AT ITS BEST!



. . . use NORDBERG DIESELS to solve a wide range of power problems

• Nordberg Type 4FS "Packaged" Diesel Power Units were developed to meet the need for simple, compact, dependable units capable of continuous heavy duty service. They are built in 1, 2, and 3-cylinder models, developing from 10 to 45 horsepower or 6,000 to 30,000 watts at medium engine speed to stand the gaff of all kinds of tough jobs.

The 4FS series incorporates the same high standards of design, construction and performance that have been identified with world-famous Nordberg Diesels for over 35 years. For electric power, for pumping, for energizing lifting magnets, and for scores of straight power applications . . . you just can't beat the reliability, low operating cost and minimum maintenance offered through the use of Nordberg 4FS Diesels.

NORDBERG MFG. CO., Milwaukee, Wis.

NORDBERG

BUILDERS OF AMERICA'S LARGEST LINE OF HEAVY-DUTY DIESELS

Mail This Coupon Today

Nordberg Mfg. Co., Milwaukee, Wisconsin

Send catalog covering Nordberg Type 4FS Diesels. I am interested in a unit for the following service:

_____

Your Name_____

Company Name_____

Address_____

City_____ Zone____ State_____

4-552-ICQFMOP

Eliminate 70% to 90% of Conveyor Downtime

U.S. Pat. No. 3548399—Others Pending

Cedarapids Schrock Built by IOWA

MOTORIZED HEAD PULLEYS

eliminate maintenance on chains, belts, sprockets, Universal drives, countershafts, etc.

EVERYTHING is contained INSIDE the pulley shell!

HERE'S a money-saving departure from conventional conveyor drives. A Cedarapids-Schrock *Motorized* Head Pulley is simply a new application of the long-proven gear reduction drive, with everything . . . electric motor, reduction gears and all moving parts . . . contained inside the drum, completely protected from grit, dirt and weather and with no outside parts or motors to service. 70% to 90% of conveyor trouble and downtime is saved by eliminating the exposed parts necessary with conventional pulley drives. In operation, the pulley shell rotates about the electric motor which is held stationary by a torque arm attached to the conveyor frame. The speed of the shell depends on the combined reduction ratio of the pinions and gears inside the shell. Compact, easy-to-install, job-proved Motorized Head Pulleys are available in sizes from 5 to 30 HP and in various widths.

Find out all the advantages of converting your belt conveyor or belt-bucket elevator installations to *motorized* efficiency before you need head pulley replacements. See your distributor today, or write for Bulletin MP-1.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U.S.A.

Built for sale in Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah and Washington by

YUBA MANUFACTURING CO.
(Pulley and Sprocket Department)
Benicia, Calif.

KENNAMETAL Inc.

BUYS TANTALITE • COLUMBITE (NIOBITE)

Also: TUNGSTEN CONCENTRATES • COBALT

Prompt, businesslike settlement by private tantalite user and dealer secures you the best results. Cash advance against settlements. 50% or higher combined pentoxides (Cb_2O_5 plus Ta_2O_5) purchased. Our superior refining processes enable us to utilize lower grade products and thus to minimize penalties.

Write or cable your offer to:

KENNAMETAL Inc.,
LATROBE, PA. U.S.A.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES

YES—IT'S HERE!

NEW U.S. ROYAL
FULL-LUG CON-TRAK-TOR
NEW STRENGTH NEW TRACTION NEW OFF-ROAD SAVINGS!

NOW

● **Triple Impact Protection!**
Extra layers of rubber between plies.
Double shockpads extending well into sidewalls.
New rock-resister cap-plies in crown.

● **Full-Lug Traction!**
Exclusive full-width grip—lug-wide traction.
Open center—actually cleans itself.
Lugs are off-set—no sideslips.
Rounded shoulders for maximum flotation.

● **True Tire Economy!**
New cushioned carcass stands up longer for extra recaps.
Special-compound tread resists cuts—stops lug-shearing.
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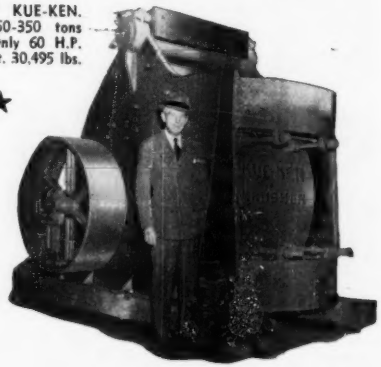

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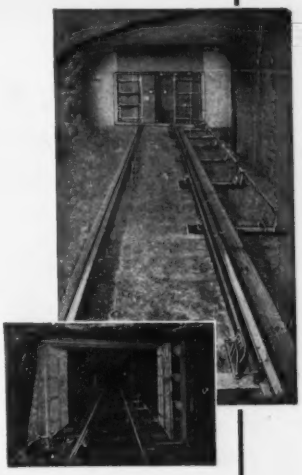

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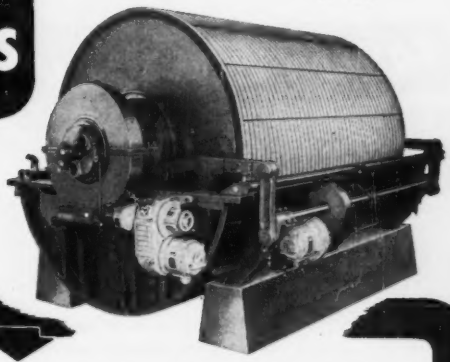

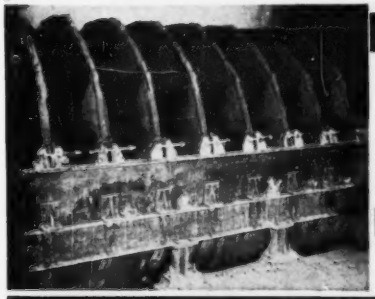

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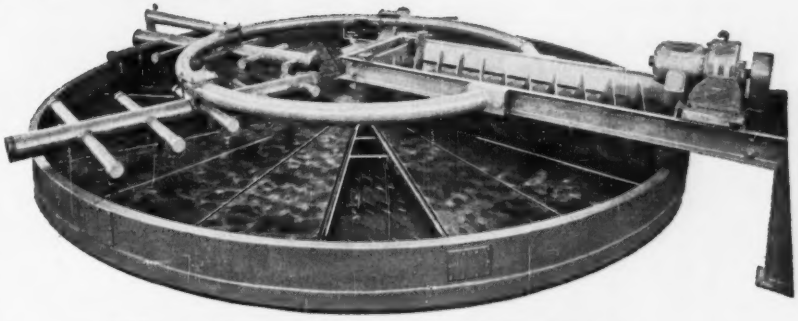

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All Flow is Downward Aided by Gravity

AND every operation on the Horizontal Filter that needs to be seen can be seen:

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- rate and effectiveness of dewatering
- direction and distribution of wash
- cake discharge

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The Horizontal Filter handles pulps with certain crystalline or fibrous solids or where they tend to settle rapidly. While this filter and the Dorrco somewhat complement one another, the Horizontal offers certain special advantages. It provides exceptionally high capacity and excellent washing. It can handle big tonnages.

If you have a product in the classification outlined above, that requires dewatering or washing, tell us about it in detail. We'll be glad to recommend the best filter to bring about the results you want.

The important fact to keep in mind is that, including the Horizontal and Dorrco, we have four distinctly different continuous vacuum filters for handling mineral products as well as several pressure type filters from which to select. And, further, in making our recommendations we call upon 45 years filtration experience in the metallic and non-metallic mining industries.

Oliver Horizontal Filter
Scroll Discharging Cake

*U.S. Patent Nos.
2,588,912
2,588,976

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Americans Are Rolling Up Their Sleeves!

YES, ALL KINDS OF PEOPLE ARE GIVING BLOOD SO THAT OUR WOUNDED MAY LIVE!

● Today, the blood of a Boston bookkeeper may be flowing through the veins of a wounded kid from a Kansas farm . . . the blood of a pretty Southern housewife may have saved the life of a grizzled leatherneck. For, blood is blood, a God-given miracle for which there is no substitute . . . and when a man's life hangs in the balance and blood is needed, there is nothing else to take its place!

Right now the need for blood is urgent. In hospitals —at home and overseas— many men require four and six transfusions during delicate operations. And the blood *must be there*—when it's needed. So give the most precious gift of all—*your* blood!

Be assured that giving blood is neither difficult nor distressing. And what a thrill there is in knowing that you've performed a really unselfish act! So call your local American Red Cross today and make an appointment. And tell your friends and neighbors about your experience. Let them share the wonderful feeling Americans get when they roll up their sleeves—and give blood.

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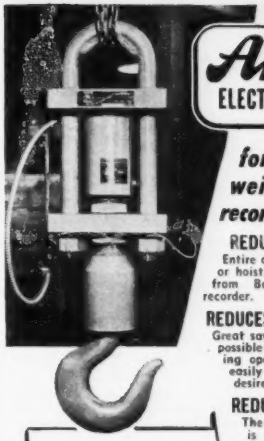

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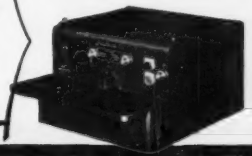

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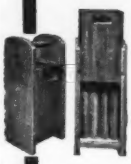

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P 6183 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

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SW-5585
Engineering & Mining Journal
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16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
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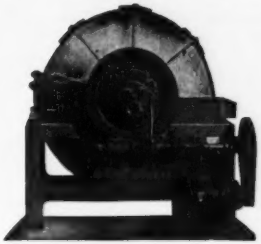

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CLAM SHELL BUCKETS: Blaw Knox 2½ yd., model W730, weight 6200 lbs., material handling type. Also, one Hayward class E, 2½ yd. Both offered with or without new spare parts.

LOCOMOTIVE CRANE: Link Belt 25 ton, std. R.R. gauge, gasoline powered, air brakes, cast steel trucks, bucket handling, with 1½ yd. clam shell, thoroughly modern, excellent condition.

KILNS & DRYERS: 2—6' x 286 ft. Kilns, brick lined, ⅞" plate, used only 2 years @ 1000 degree heat, like new, with or without Fuller Lehigh grate type Coolers. 1—7 ft. x 120 ft. and 2—8 ft. x 65 ft.

PULVERIZERS: Hardinge Ball Mill size 5' x 22", steel lined, complete with disc feeder and 30 H.P. motor. 1—3' x 4' Eimco Ball Mill complete, NEW, UNUSED. 1—Marcy Rod Mill 8' x 12' and one 5' x 14', manganese lined, with motors and drive.

CRUSHERS, JAW: Sizes 12" x 15" to 48" x 60".

CRUSHER, ROLL: Traylor 18" x 42", heavy duty.

CRUSHER SPECIAL: Pioneer 30" x 42", all steel, roller bearings, condition like NEW.

CRUSHING PLANT: Cedar Rapids, portable, 2 unit type, capacity 40 yds. per hour.

MINE HOISTS: 1—Vulcan single drum 3' dia., 2'9" face, 75 H.P., 220 volt, NEW condition. 1—150 H.P., 6'0" dia., 6'9" face. 1—Vulcan double drum, 200 H.P., 8' dia., 4' face, one drum clutched. 1—250 H.P. 72" dia., 48" face. All 3 phase, 60 cycle, 2300 volt, with control equipment.
Head Frame for double shaft 16'9" x 17'3", height 55 ft., with or without 8 ft. dia. sheaves for 1½" rope.
Other Hoists 100 H.P. to 1050 H.P., single and double drum with electrical equipment.

We Buy and Sell Equipment Throughout North and Central America.

A. J. O'NEILL
LANSDOWNE, PA.
Phila. Phones: MAdison 3-8300 — 3-8301

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Unloading Hopper Cars

IS A FAST, ONE-MAN OPERATION

Unloading Time

Actual examples with Allis-Chalmers car shaker. Good unloading facilities.

WET SAND
1½ TO 2¼ MINUTES.

ROCK
½ TO ¾ MINUTES
. . . ½ to 6 in. crushed material.

COAL
1 TO 6 MINUTES
. . . depending on surface moisture. ROM to 10 mesh x 0 screenings.

YOU CUT UNLOADING COSTS . . . Push a button and your Allis-Chalmers car shaker will empty a hopper-bottom car in *minutes* . . . and cleanly, too, even if your bulk material is damp, compacted or partially frozen. In addition, it promotes an even flow of material from the unloading station.

YOU REDUCE UNLOADING HAZARDS . . . No workman need enter a hopper car with an Allis-Chalmers car shaker. It isn't necessary, either, to re-position the shaker on the car or to adjust it manually to fit the car. Ask the A-C representative in your area to show you how this car shaker can save money in your operations. Call him, or write: Allis-Chalmers, Milwaukee 1, Wisconsin. A-3637

ALLIS-CHALMERS AC

NEW FACTORY-SEALED IDLER

TIMKEN® bearing equipped Continental idler can be re-lubricated

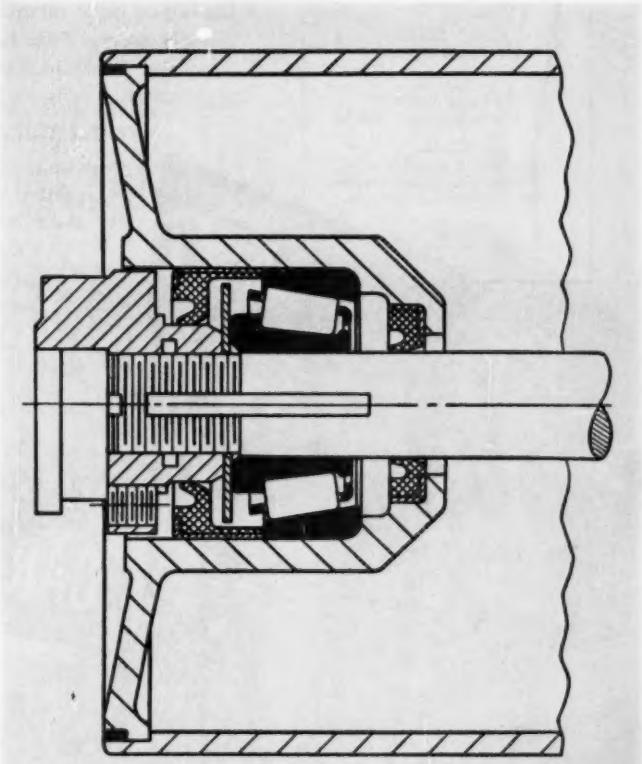
THE Continental Gin Company reports that its new type UST idler, lubricated and sealed at the factory, will stay in top operating condition for years at a time—*without re-lubrication!* Yet, should working conditions demand, it *can* be re-lubricated right on the job with the roll in place! Continental engineers say: "When seals or lubricant are no longer effective, the idler and bearings are still good! The entire unit can be disassembled, seal replaced if necessary, lubricant renewed, and put back in service to add still more years of trouble-free service to its operating life."

To insure long life and keep maintenance costs down, Continental specified Timken® tapered roller bearings for its new type UST idler. Because Timken bearings keep idler shafts concentric with housings, closures are made more effective. Lubricant is retained, dirt and moisture kept out. Operation is more economical.

Timken bearings have exceptional load-carrying capacity because of line contact between rollers and races. And due to their tapered construction, Timken bearings carry both radial and thrust loads in any combination.

Because of their true rolling motion and extremely smooth surface finish, Timken bearings reduce friction and wear. Idlers turn freely, easily. Belts last longer.

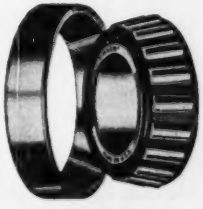
No other bearings give you all the advantages of Timken bearings. Specify them for the machines you build. Make sure they're in the machines you buy. Always look for the trademark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



How **CONTINENTAL GIN COMPANY** mounts its new UST idler on Timken bearings to insure minimum maintenance and long life.

TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◁▷ AND THRUST ◁▷ LOADS OR ANY COMBINATION ◁▷